CNC CONTROLLER

SENTROL® 2

MAINTENANCE

CURIOUS

Curious co.,Ltd

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(This manual attempts to provide as much diverse contents as possible. Note, however, that descriptions of the [This cannot be done] or [This is not possible] type have not been included to reduce the number of pages of this manual. Therefore, anything that is not described as [Possible] in this manual should be interpreted to mean [Not possible].

For Safe Maintenance

This manual describes matters requiring attention in relation to the safety of the CNC equipment to enable Machines where CNC equipment (Machine) is mounted to be maintained more safely.

Maintenance work for CNC equipment is dangerous for many reasons. Therefore, maintenance work must be carried out only by personnel with sufficient training on maintenance and safety.

Depending on the CNC equipment used, some of the functions available in other machines may not be supported. In this case, just read any warning or caution that does not apply to a particular Machine and go on to the next section.

For matters requiring attention in relation to Machine safety, refer to the instruction manual issued by the Machine manufacturer.

In addition, when programming or checking the operation of the Machine during maintenance work, do so only after sufficiently understanding the instruction manual issued by the Machine manufacturer and this manual.

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1 About Warnings, Cautions, and Notes

In this manual, matters requiring attention in relation to the safety of the maintenance worker (Operator) and prevention of Machine damage are marked with 『Warning』 or 『Caution』 depending on the degree of importance. For supplemental description, 『Note』 is also used. Please read the entries marked with 『Warning』, 『Caution』, and 『Note』 before using the equipment.

Warning

This is used for cases wherein a dangerous situation may occur and lead to death or result in serious injury to the operator if such situation is not handled properly.

Caution

This is used for cases wherein a dangerous situation may occur and result in minor injury to the operator or cause material damage if such situation is not handled properly.

Note

This is used to provide supplemental description in addition to Warnings and Cautions.

2 Warnings and Cautions Regarding Maintenance Work

Warning

1. When the power magnetic cabinet is checked with the door open

(1) In the power magnetic cabinet is a high-voltage area (part marked with). Contact with a high-voltage area may cause electric shock. Check whether the high-voltage area is equipped with a cover before proceeding with the work. Even if the high-voltage area has been checked, however, direct contact with a terminal may cause electric shock.

(2) In the power magnetic cabinet are protrusions such as corners from various units. Such protrusions may cause injury; hence the need for caution.

2. When Machine operation is checked with the cover opened

(1) Clothing may get caught in the main spindle and cause an accident.
Operate the Machine while maintaining sufficient distance from the Machine to prevent clothing from getting caught in the main spindle.

(2) Operate the Machine in empty state without engaging in any actual processing. If actual processing needs to be executed, perform checking from a safe location (the clamp on the work may come off, or the tip of a tool may break and cause injury to the operator).

3. When work is actually processed, check whether the Machine is being operated correctly without any tool or work attached using functions such as Single Block, Traverse Override, and Machine Lock. Otherwise, insufficient checking may result in damage to the work or Machine or injury of the operator due to an unexpected movement of the Machine.

4. Check whether input data has been entered correctly before proceeding to the next operation step. In case of error in the input data, either the work or Machine may be damaged, or the operator may be injured due to an unexpected movement of the Machine.

Warning

5. Check whether a value appropriate for the operation has been set for the transfer speed. Normally, there is a limit to the maximum transfer speed for each Machine. For best results, follow the instructions in the manual (optimum speed also varies by operation).

6. When using the tool compensation function, make sure the compensation direction and amount are checked sufficiently. If the Machine is operated with incorrect data, either the work or Machine may be damaged, or the operator may be injured due to an unexpected movement of the Machine.

3 Warnings and Cautions Regarding Replacement Work

Warning

1. Be sure to turn OFF both the power on the CNC equipment and the main power switch in the power magnetic cabinet. If only the CNC power is turned OFF, power may still be ON for the Servo part; thus causing damage to the unit during replacement as well as electric shock.

2. For the Servo Amp and Spindle Amp, some voltage may occur for a short while after power has been turned OFF; thus possibly causing electric shock in case of contact.

3. When replacing a heavy item, make sure that work is carried out by more than two operators (unit may be dropped, or injury may result if work is carried out by a single person).

4. When replacing a unit, make sure the setup for the replacement unit is identical to that of the unit being replaced (refer to the manual of the corresponding device for details). Otherwise, either the work or Machine may be damaged, or the operator may be injured due to an unexpected movement of the Machine during operation.

4 Warnings and Cautions Regarding Parameters

Warning

1. When processing a work for the first time after changing a parameter, do so with the Machine cover closed. For automatic operation, use functions such as Single Block, Traverse Override, and Machine Lock or check for the correct operation of the Machine without any tool or work attached. Otherwise, insufficient checking may result in damage to the work or Machine or injury of the operator due to an unexpected movement of the Machine.

Caution

2. The parameters for CNC or internal PLC are set up as optimum values. As such, they need not be changed as a rule. If a parameter needs to be changed, however, do so only after sufficiently understanding the effect of the parameter.

   If a parameter is not set up correctly, either the work or Machine may be damaged, or the operator may be injured due to an unexpected movement of the Machine.

5 Warnings Regarding Regular Maintenance Work

Warning

1. Replacing the Backplane for the Memory Backup Battery

Only personnel with sufficient training on maintenance and safety should perform this work.When the power magnetic cabinet is opened, and the CNC backplane is replaced, be sure to avoid contact with the high-voltage circuit part (mark or shock prevention cover attached). In case of contact with an exposed part, electric shock may occur.

Note

Since a CNC must maintain data such as program compensation amount and parameters, a battery is used even when power is turned OFF.

If the battery voltage drops, a Battery Voltage Drop Alarm will be displayed on the Machine control panel or LCD screen.

If the Battery Voltage Drop Alarm is displayed, please contact us for the replacement of the Backplane Unit where the battery is attached. Otherwise, the CNC will not operate normally.

Warning

2. Replacing the Battery for the Absolute Encoder

Only personnel with sufficient training on maintenance and safety should perform this work.

When the power magnetic cabinet is opened, and the Battery is replaced, be sure to avoid contact with the high-voltage circuit part (mark or shock prevention cover attached). In case of contact with an exposed part, electric shock may occur.

Note

A battery is used to enable the Absolute Encoder to maintain the absolute position.

If the battery voltage drops, a Battery Voltage Drop Alarm will be displayed on the LCD screen or AC Servo Drive.

If the Battery Voltage Drop Alarm is displayed, replace the battery immediately.

If the battery is not replaced, the absolute position data in the Absolute Encoder will be lost. Refer to the manual of each AC Servo Motor maker for battery replacement.

Warning

3. Replacing the Fuse

Fuses shall be replaced only after the reason for the fuse blowing up has been ascertained and the cause remedied.

Only personnel with sufficient training on maintenance and safety should perform this work.

When the power magnetic cabinet is opened, and the fuse is replaced, be sure to avoid contact with the high-voltage circuit part (mark or shock prevention cover attached). In case of contact with an exposed part, electric shock may occur.

Chapter 1 Troubleshooting and Treatment

1. How to troubleshoot

Problems are classified depending on the categories below. Based on the classification, perform troubleshooting and treatment appropriately.

(1) When ALARM MESSAGE is displayed on the screen

1) NO. 714 SERVO ALARM is displayed.....Chapter 2 1 (page 2-7)

2) SPINDLE ALARM is displayed. .....Chapter 3 (page 3-1)

3) NC-related ALARM is displayed. .....2.1 (page 1-2)

(2) Problems with NC function and malfunction

1)Cannot operate with Manual Pulse Generator (MPG).....4 (page 1-26)

2)Cannot operate asynchronous move (threading) .....4 (page 1-27)

3)Cannot operate automatically .....4 (page 1-28)

4)Home location incorrect .....4 (page 1-29)

(3) Communication breakdown .....5 (page 1-36)

※ For A/S request, refer to "3. Things to consider when requesting for A/S in Chapter 8" (page 8-2). For ALARM NOS. 1000 ~ 2999 and those with no number, however, request the Machine Maker for after-sales service.

Contact: TEL. (02) 869-5595
(Ext.) 126

2. ALARM MESSAGE and Treatment

2.1 ALARM numbers`

ALARM Numbers	Message	Reference
0 ~ 299	(1) Program miss (PS ALARM)	Page 1-3 ~
300 ~ 399	(2) Communication ALARM (SR SEND/ RECEIVE)	Page 1-12 ~
400 ~	(3) ALARM related to temperature and power	Page 1-14 ~
500 ~	(4) Out-of-area ALARM (OT ALARM)	Page 1-15 ~
550 ~	(5) ALARM related to external data input	Page 1-16 ~
580 ~	(6) ALARM related to RIGID TAPPING	Page 1-17 ~
700 ~	(7) ALARM related to SERVO	Page 1-18 ~
9000 ~	(11) SYSTEM ALARM	Page 1-20 ~
1000 ~ 2999	* ALARM related to machine and sequence	Page 1-22 ~
No number	* MESSAGE related to machine manipulation	Page 1-22 ~

Note) Definitions of terms

1) “L line” stands for SENTROL2-L (for lathe).
2) “M line” stands for SENTROL2-M (for machining center, milling).
3) “L-Pro” stands for “SENTROL2-L manual’s Programming.”
4) “M-Pro” stands for “SENTROL2-M manual’s Programming.”
5) “L-Manipulation” stands for “SENTROL2-L manual’s Manipulation.”
6) “M-Manipulation” stands for “SENTROL2-M manual’s Manipulation.”

2.2 ALARM LIST

1) PROGRAM MISS (P/S ALARM)

Number	Message Displayed on the Screen	Reference
001	**TOO MANY DIGITS OR OVERLIMIT** Data exceeding the maximum allowable number of digits, or allowable limit inputted	"L-Pro" Chapter 2 1. NC Program outline 「Basic address and reference scope」 "M-Pro" Chapter 2 6. Programming practice 「Basic address and reference scope」
002	**LL USE OF NEGATIVE VALUE** Sign "-"inputted after an address with which it cannot be used, or two or more "-" signs inputted	
003	**ILL USE OF DECIMAL POINT** Decimal point inputted after an address with which it cannot be used, or two decimal points inputted	
004	**IMPROPER G CODE** Unusable G code commanded	"L-Pro" Chapter 2 2. Programming and function 「SENTROL2-L table for prepared function」 "M-Pro" Chapter 2 6. Programming practice 「SENTROL2-M table for prepared function」
005	**IMPROPER NC ADDRESS** Unusable character inputted in significant area	"L-Pro" Chapter 2 2. Programming 「WORD」 "M-Pro" Chapter 2 6. Programming practice 「Basic address and reference scope」
006	**INVALID BREAK POINT OF WORD** Address not followed by appropriate data but by another address or EOB code	
009	**TOO MANY WORDS IN 1 BLOCK** Block exceeding 128 characters commanded	
011	**ILL MODE GOTO/WHILE DO** GOTO statement or WHILE DO statement contained in a main program in TAPE mode	
012	**TOO LARGE OFFSET NO**. Commanded offset number too large (allowable maximum number set by parameter #6002 DO1 and OD2)	"L-Manipulation" Chapter 5 2. 「SENTROL2-L parameter view」 "M-Manipulation" Chapter 5 2. 「SENTROL2-M parameter view」
013	**ILL TOOL NO.** Commanded tool number too large	"L-Pro" Chapter 2 1.NC Program outline 「Basic address and reference scope」 "M-Pro" Chapter 2 6. Programming practice 「Basic address and reference scope」
020	**S CODE OUT OF RANGE** Spindle speed exceeding the maximum speed while rigid tapping (parameter #5766???) was commanded	
021	**SQ NO. NOT FOUND** Specified sequence number not found at the jump destination specified by GOTO-n or M99 Pn	

Number	Message Displayed on the Screen	Reference
023	**NO P,Q COMMAND AT G70~G73** Neither P nor Q specified in canned cycle G71,G71,G72 blocks for multiple repetitive cycles Only L line	"L-Pro" Chapter 3 1. Prepared function 「Multiple fixed cycle (G70~G76)」
024	**ILL COMMAND IN G70~G76** Illegal command in canned cycle G70~G76 block Only L line	
025	**P,Q BLOCK NOT FOUND** P or Q sequence number block specified in canned cycle G70,G71, or G72 blocks not found Only L line	"L-Pro" Chapter 3 1. Prepared function 「Multiple fixed cycle (G70~G76)」
026	**ILL COMMAND IN P-BLOCK** Illegal command in P sequence number block specified in canned cycle G70,G71, or G72 blocks Only L line	"L-Pro" Chapter 3 1. Prepared function 「Multiple fixed cycle (G70~G76)」
027	**ILL COMMAND IN PROG** G code in group 01 other than G00,G01,G02, and G03, one shot G code other than G04, or G65,G66,G67,M98, or M99 specified in sequence number blocks designated by P and Q of G70,G71, or G72 Only L line	"L-Pro" Chapter 3 1. Prepared function 「Other things to consider regarding fixed cycle」
028	**G70~G73 IN FORBIDDEN MODE** Canned cycles G70~G73 specified in mode other than AUTO operating mode Only L line	
029	**ILL COMMAND IN Q-BLOCK** Chamfering or corner R specified in a Q sequence number block specified in canned cycle G70~G73 Only L line	
030	**PROG NOT FOUND** Program whose program number is called by M98,G65,G66, or G/M/T code not found, or program to return to by M99 code	
031	**PROG IN USE** Program being edited in the background called for execution in the foreground	
032	**NO RADIUS COMMAND IN G02 G03** CUSTOM MACRO	

Number	Message Displayed on the Screen	Reference
040	**DUPLICATE NC, MACRO STATEMENT** NC statement and macro statement specified in the same block CUSTOM MACRO	
042	**DUPLICATE MACRO-CALL WORD** Macro call command specified twice or more in the same block CUSTOM MACRO	
043	**DUPLICATE NC-WORD & M99** Address other than O,N,P or L specified in the same block as M99 under the macro modal call condition (G67)	
044	**USE G AS ARGUMENT** Address G serving as macro argument CUSTOM MACRO	"L-Pro" Chapter 3 1. Prepared function 1)「MACRO BY G65」 "M-Pro" Chapter 3 20.Custom macro 20.1.1「Simple call」
045	**TOO MANY TYPE-2 ARGUMENT** Arguments specified in more than 11 sets in custom macro argument specification CUSTOM MACRO	"L-Pro" Chapter 3 1.Prepared function 1)「MACRO BY G65」 "M-Pro" Chapter 320. Custom macro「Simple call」B.「Acceptance designation Ⅱ」
046	**CANCEL WITHOUT MODAL CALL** Call mode cancel (G67) specified in mode other than macro modal call mode (G66) CUSTOM MACRO	
049	**ZERO DIVIDED** Division specified with zero divisor CUSTOM MACRO	
050	**VARIABLE NO. OUT OF RANGE** Illegal variable number specified CUSTOM MACRO	"L-Pro" Chapter 3 1.Prepared function 5) Program macro body ④「Type of variables」 "M-Pro" Chapter 3 Prepared function 20.2.3「Type of variables」
051	**WRITE PROTECT VARIABLE** Variable employable on the left member side of an expression employed on the left number side of the expression CUSTOM MACRO	
052	**READ PROTECT VARIABLE** Variable employable on the left member side of an expression employed on the right member side of the expression CUSTOM MACRO	
053	**TOO MANY BRACKET NESTING** Multiplicity of brackets "()" exceeding the allowable range (5 level) CUSTOM MACRO	
054	**ARGUMENT VALUE OUT OF RANGE** Argument of function exceeding the allowable range CUSTOM MACRO	

Number	Message Displayed on the Screen	Reference
055	**TOO MANY SUB, MACRO NESTING** Total multiplicity of subprogram call and macro call exceeding the allowable range (7level) CUSTOM MACRO	
056	**TOO MANY MACRO NESTING** Multiplicity of macro call exceeding the allowable range (2level) CUSTOM MACRO	
057	**MISSING END STATEMENT** END command corresponding to DO command missing CUSTOM MACRO	
058	**MISSING GO STATEMENT** DO command corresponding to END command missing CUSTOM MACRO	
059	**ILL EXPRESSION FORMAT** Illegal macro expression format CUSTOM MACRO	
060	**ILL LOOP NO**. DO, END number exceeding the allowable range CUSTOM MACRO	
061	**TOO LONG MACRO SENTENCE** Macro statement too long CUSTOM MACRO	
070	**SQ NO. OUT OF RANGE** Sequence number other than 1~99999 CUSTOM MACRO	
071	**MISSING OPEN BRACKET** Number in open brackets "[" smaller than the number in closed bracket "]" CUSTOM MACRO	
072	**MISSING CLOSE BRACKET** Number in closed brackets "]"smaller than the number in open bracket "[CUSTOM MACRO	
073	**MISSING " = "** Command "="missing CUSTOM MACRO	
074	**MISSING "/"** Command "/" missing CUSTOM MACRO	
075	**MACRO STATEMENT FORMAT ERROR** Error in macro statement format CUSTOM MACRO	

Number	Message Displayed on the Screen	Reference
077	**IF STATEMENT FORMAT ERROR** Error in macro IF statement format CUSTOM MACRO	
078	**WHILE STATEMENT FORMAT ERROR** Error in macro WHILE statement format CUSTOM MACRO	
090	**G10 FORMAT ERROR** Error in format of G10 statement	"M-Pro" Chapter 3 3. Set data (G10)
101	**ZERO RETURN NOT FINISHED** After turning on power, move command specified for axes where the reference point return has not been finished	
103	**TOO MANY SIMULTANEOUS CONTROL AXES** More than the required simultaneous control axes commanded	In the case of G02 and G03, the program requires correction. In the case of G90 and G94, alarm occurs when parameters 1034 and 1035 have the same value. They require correction as different values each.
105	**G27 ERROR** Axis specified by G27 (zero return check) not yet returning to zero point	
106	**ILL PLANE SELECT** Error in plane select command (parallel axes specified simultaneously or error in parameter #1032 set error.)	
107	**FEED ZERO (COMMAND)** Cutting feed rate command (F code) as 0	
109	**RPR IN TOOL OFFSET** Reference point return commanded (G28,G30) specified in tool nose R compensation mode	
110	**OVER TOLERANCE OF RADIUS** Arc where the difference of radius value at start point and end point is larger than the parameter (#2410) set value specified	
111	**ILL LEAD COMMAND** In variable lead thread cutting, K value (lead increase/decrease amount) higher than the maximum command value, a minus value, or higher than the maximum lead Only L line On	
112	**ILL AXIS SELECTED** **Error in parameter #5640 set value**	
113	**ILL DRILLING AXIS SELECT** **Selection of drilling axes not correctly specified in drilling canned cycle** Only M line	"M-Pro" Chapter 3 22. Drilling cycle 22.1「Table for fixed cycle」

Number	Message Displayed on the Screen	Reference
114	**ILLEGAL USE OF G12.1/G13.1** Error in condition to start or end polar coordinate interpolation	
115	**ILLEGAL USE OF G-CODE** G code that cannot be commanded in G12.1 mode specified in G12.1 mode	
116	**ILLEGAL G07.1 AXIS** Cylindrical interpolation specified on an axis where cylindrical interpolation cannot perform	
117	**ILLEGAL G-CODE USE (G07.1 MODE)** G code that cannot be commanded in cylindrical interpolation mode specified in cylindrical interpolation mode	
118	**LEAD *S OUT OF RANGE** Feed rate per revolution exceeding the allowable maximum speed (parameter #1422)	
120	**RPR ERROR** When grid type reference point return using digital type position detector is performed, one revolution signal not inputting to define the grid position while the deceleration limit switch is turned ON	Refer to page 1-29 of this manual.
121	**OFFSET C START UP CANCEL BY CIR** Tool nose R compensation being started or canceled in arc mode	"L-Pro" Chapter 3 1.Prepared function .「Edge correction」
122	**OFFSET C ILL PLANE** Plane selection being changed in tool nose R compensation mode	
123	**OFFSET C INTERFERENCE** Cutter interference detected in tool nose R compensation mode	"L-Pro" Chapter 3 1.Prepared function 「Edge correction」
124	**OFFSET C NO SOLUTION** No intersection point calculated in tool nose R compensation mode	
125	**ILL COMMAND G45~G48 IN OFFSET C** Tool offset command (G45~G48) specified in tool diameter compensation mode Only M line	
126	**ILL COMMAND IN G41, G42** In tool nose R compensation mode, chamfering or corner rounding specified in start up block, cancel block, or block where G42,G41 code is commanded in G41,G42 mode, respectively, or cutter interference detected when chamfering or corner rounding is performed	

Number	Message Displayed on the Screen	Reference
130	**ILL ADDRESS** Illegal address specified when loading parameters or pitch error compensation data from a tape	
131	**MISSING ADDRESS** Necessary address not specified when loading parameters or pitch error compensation data from a tape	
132	**ILL DATA NUMBER** Error in specified data number at parameter setting	
133	**ILL AXIS NUMBER** Error in specified axis number at parameter setting	
134	**TOO MANY DIGITS** Number of digits of data exceeding the allowable value when loading parameters or pitch error compensation data from a tape	
135	**DATA OUT OF RANGE** Data value exceeding the allowable value range when loading parameters or pitch error compensation data from a tape	
136	**MISSING AXIS NUMBER** No axis number specified when loading parameters requiring axis specification from a tape	
137	**ILL USE OF MINUS SIGN** Illegal use of data sign when loading parameters or pitch error compensation data from a tape	
138	**MISSING DATA** Address not followed by numeric when loading parameters or pitch error compensation data from a tape	
140	**PROG NOT MATCH** Tape program not matching a program in the memory	
141	**G37 IMPROPER AXIS COMMAND** Axis not specified, or two or more axes specified in the block commanded with tool measurement	
142	**G37 SPECIFIED WITH T-CODE** T code not commanded before the tool measurement command block	
143	**G37 OFFSET NO. UNASSIGNED** T code not commanded before the tool measurement command block	

Number	Message Displayed on the Screen	Reference
144	**G37 ARRIVAL SGNL NOT ASSERTED** In tool measurement, command measurement position arrival signal "ON" before reaching the area specified by parameter (#7331~7333) or not "ON" before coming out of the area	
150	**TOO MANY ADDRESS** Two or more of I,(J),K,R commanded in the same block where chamfering or corner rounding is specified Only L line	
151	**NOT ONE AXIS MOVE WITH-I~R** Move command of the block where chamfering or corner rounding is specified not one axis command Only L line	"L-Pro" Chapter 3 1.Prepared function 「Automatic chamfering and corner R」
152	**MISMATCH AXIS WITH I~R** I(K) commanded in X,Z axis move command block, respectively, where chamfering or corner rounding is specified Only L line	
153	**MISSING VALUE AT I~R** Move distance in the block where chamfering or corner rounding is specified less than the specified chamfering or corner radius amount Only L line	
154	**NOT G01 AFTER I~R** Command after the block where chamfering or corner rounding is specified not G01 Only L line	
155	**MISSING MOVE AFTER I~R** Incorrect direction or move distance of the command of the next block to the block where chamfering or corner rounding is specified Only L line	
158	**ILL FORMAT IN FREE CHAMFERING** Error in format of chamfering or corner rounding at any angle 1) ",C" and ",R" commanded in the same block 2) ,C(,R) and "C", "R" commanded in the same block. 3) ,C(,R) and "I","J","K" commanded in the same block **4)** Character other than "C" and "R" following ","	
159	**MISSING VALUE ATR (FRCHMF)** Arc inserted by ??? function cannot be tangent to two lines (radius too large)	
160	**ILL LIFE GROUP NO.** Tool group number exceeding the maximum value	
161	**NOT FOUND GROUP AT LIFE DATA** Tool data of tool group specified in a program not specified	

Number	Message Displayed on the Screen	Reference
162	**OVER MAX TOOL TIMES** Data of tool group specified in a program not specified	
163	**NOT FOUND T COMMAND** Number of tools registered in a tool group exceeding the maximum registerable number	
164	**NOT USE TOOL IN LIFE GROUP** H99 command or D99 command is specified when no tool is used belonging to any tool group. Only M line	
165	**ILL T COMMAND AT M06** T command following M06 command in a program not matching the currently used tool group number Only M line	
166	**NOT FOUND P, L COMMAND** P or L command missed at the head of a tool group setting program	
167	**OVER MAX LIFE GROUP TIMES** Number of tool group to be set exceeding the allowable maximum number	
168	**ILL L COMMAND** L command in tool group setting program is 0, or allowable maximum life count exceeded	
169	**ILL H D T COMMAND** H, D, T command in tool group setting program exceeding the maximum value	
170	**ILL TYPE OF TOOL CHANGE** Error in setting of tool change method	
171	**ILL FORMAT AT LIFE DATA** Illegal command specified in a tool group setting program	
172	**NO TOOL LIFE DATA** Tool group specified in a program before setting the tool group data	
175	**SPINDLE OTHER AXIS MOVE** Other axis move instructions in the same block as spindle positioning command	
176	**SPINDLE NOT ZERO RETURN** Spindle positioning commanded without spindle orientation (zero return)	

Number	Message Displayed on the Screen	Treatment
180	**G68 FORMAT ERROR** Error in format of G68 statement Only M line	When commanding using absolute value, it must be 2 axes.
190	**DUPLICATE COMMAND NC&PLC** PLC command specified to control an axis moving as the NC axis as the PLC axis or vice versa	
197	**OTHER AXES ARE COMMANDED** Other controlled axes and indexing axis of index table simultaneously commanded	Check the optional function that is valid for the NC in use.
200	**NO OPTION** Option functions unavailable in the currently used NC attempted	Check the optional function that is valid for the NC in use.

2) Communication alarm (SR SEND/RECEIVE)

Number	Message Displayed on the Screen	Treatment
300	**TH ERROR** TH ALARM (character with parity error specified in significant information section)	BAUD RATE must be small. Check CABLE's EARTH and SHIELD.
301	**TV ERROR** TV ALARM (number of characters in one block not even)	Same If odd numbers are not set, NO.0<TVC>=0.
302	**END OF RECORD** EOR code specified halfway in a block	
303	**PARAMETER OF RESTART ERROR** Setting error in the parameter of program restart	
304	**DUPLICATE PROG** Program whose program number is already used by other program being loaded (only when parameter #2200 REP is set to 0)	PARAMETER NO. 2200<REP>=1 "L,M-Manipulation" Chapter 3 Manipulation in detail 9. Function of input and output with external devices B. Program input and output with RS232C
305	**NO O, N GEAD OF PROG** No O or N address at the head of the program (no program number at the program head)	If the received program has no number, keys for input and number change are selected to enter the program number.
306	**PROGRAM IN OPERATION** Same program number specified, with that of the current executing program loaded from external I/O device	Program number change

Number	Message Displayed on the Screen	Treatment
312	**PARAMETER SET ERROR** An I/O interface, which is not selected at option, was specified. Or a set value of setting/parameter related to I/O device.	
331	**RX TIME OUT (RS232C1)** No data received within 5 seconds at RS232C interface 1	Other machine must be of the DC CODE control (XON/XOFF) type.
332	**OVERRUN ERROR (RS232C1)** Next character received before reading a character received by RS232C interface 1	Make BAUD RATE and STOP BIT similar to an external machine.
333	**FRAMING ERROR (RS232C1)** Stop bit of character received by RS232C interface 1 not detected	BAUD RATE must be small.
334	**BUF OVERFLOW (RS232C1)** Data exceeding 10 characters received after sending out stop code (DC3) by RS232C interface 1	Other machine must be of the DC CODE control (XON/XOFF) type.
336	**RX TIME OUT (RS232C2)** No data received within 5 seconds at RS232C interface 2	Other machine must be of the DC CODE control (XON/XOFF) type.
337	**OVERRUN ERROR (RS232C2)** Next character received before reading a character received by RS232C interface 2	BAUD RATE must be small.
338	**FRAMING ERROR (RS232C2)** Stop bit of character received by RS232C interface 2 not detected	Make BAUD RATE and STOP BIT similar to an external machine.
339	**BUF OVERFLOW (RS232C2)** Data exceeding 10 characters received after sending stop code (DC3) by RS232C interface 2	Other machine must be of the DC CODE control (XON/XOFF) type.
341	**CANNOT RESTART BEFORE RPR** Program restart being performed even though reference point return has not been completed yet (this alarm will occur when a program including G28 command is restarted after turning on power or after the emergency stop switch is turned on and off)	

3) Heat & Power alarm

Number	Message Displayed on the Screen	Treatment
401	**THERMAL SENSOR ALARM** Thermal sensor on PCB detected to be higher than 70 centigrade degrees	Refer to page 1-21 of this manual.
402	**24V DOWN** 24V voltage of controller lower than the specified voltage	Check power voltage. Refer to page 4-5.
403	**15V DOWN** 15V voltage of controller lower than the specified voltage	Check whether power voltage is 24V. Refer to page 4-5.
420	**POWER MUST BE OFF** Parameter requiring power turned off set	Turn power off first and turn it on again.

4) Over Travel Alarm

Number	Message Displayed on the Screen	Treatment
500	**+OVERTRAVEL (SOFT 1)** Tool penetrating the forbidden area of stored stroke limit 1 while moving in the plus direction	Press the cancel key and move it to the – direction. Refer to page 1-21 of this manual.
501	**-OVERTRAVEL (SOFT 1)** Tool penetrating the forbidden area of stored stroke limit 1 while moving in the minus direction	Press the cancel key and move it to the + direction. Refer to page 1-21 of this manual.
502	**+OVERTRAVEL (SOFT 2)** Tool penetrating the forbidden area of stored stroke limit 2 while moving in the plus direction	Refer to page 1-21 of this manual.
503	**-OVERTRAVEL (SOFT 2)** Tool penetrating the forbidden area of stored stroke limit 2 while moving in the minus direction	
504	**OVERTRAVEL (SOFT 3)** Tool penetrating the forbidden area of stored stroke limit 3 while moving in the plus direction Only L line	
505	**-OVERTRAVEL (SOFT 3)** Tool penetrating the forbidden area of stored stroke limit 3 while moving in the minus direction Only L line	
506	**+OVERTRABEL (HARD)** Plus stroke limit switch stepped on	
507	**-OVERTRABEL (HARD)** Minus stroke limit switch stepped on	
536	**DISCONNECTION POS CODER** Spindle position coder detected to have been disconnected	If POSITION CODER is not used in MILLING, PARAMETER 5603 PDC=1.

5) External I/O device alarm

Number	Message Displayed on the Screen	Treatment
550	**SRCH REQUEST NOT ACCEPTED** Program number search or sequence number search request not accepted (not in AUTO??? mode or in reset condition)	
551	**SPECIFIED NUMBER NOT FOUND** Program number specified by work number search not found	
552	**UNASSIGNED ADDRESS (HIGH)** Undefined address (high division) specified for high-order 4 bits (EIA4~EIA7) of address signal at external data I/O interface	
553	**UNASSIGNED ADDRESS (LOW)** Undefined address (low division) specified for low-order 4 bits (EIA0~EIA3) of address signal at external data I/O interface	
556	**OUTPUT REQUEST ERROR** Output request made again during external data input/output, or output request made to an address where no output data is present	
558	**SPECIFIED NUMBER NOT FOUND** Program number or sequence number specified by external data input not found	
559	**DI. EIDHW OUT OF RANGE** Value entered by external data input signal EID32~EID47 exceeding the allowable maximum value	
560	**DI. EIDLL OUT OF RANGE** Value entered by external data input signal EID0~EID31 exceeding the allowable maximum value	

6) Rigid tapping alarm

Number	Message Displayed on the Screen	Treatment
580	**SPINDLE EXCESS ERROR (STOP)** Spindle position deviation amount during stop exceeding the limit value preset by parameter #5752	
581	**SPINDLE EXCESS ERROR (MOVING)** Spindle position deviation amount while moving exceeding the limit value preset by parameter #5754	
582	**RIGID TAPPING MODE G42.2 OFF** When the G84 (G74)command is specified, RIGID MODE DI signal not ON while M29 command has been issued	
583	**ILLEGAL USE M29 OR S** Command position??? of M29 or error in S	
584	**ILL MOVE COMMAND IN RIGID TAPPING** Axis movement specified between M29 and G84 (G74) commanded blocks	

7) Servo alarm

Number	Message Displayed on the Screen	Treatment
707	**(ASIX NAME) EXCESS ERROR (STOP)** Position deviation amount during stop exceeding the value preset by parameter #1804	Refer to Chapter 2 SERVO page 2-3 of this manual.
708	**(ASIX NAME) EXCESS ERROR (MOVING)** Position deviation amount during stop exceeding the value preset by parameter #1805 (PARA. NO. 1805)	This occurs in case of clashing or loaded machine. The alarm is not canceled even when power is turned off and on again. (How to cancel) After setting 1823ADF1 →0(only axis with ERROR) 1822DRIFT AMOUNT →0 (only axis with ERROR) the alarm is canceled when power is turned off and on again. After cancellation, 1823 ADF 0 →1 must be reset.
709	**(ASIX NAME) DRIFT OVER** Excessive drift compensation amount (more than 1632 VELO)	Readjust SERVO ZERO. For detailed information, refer to Chapter 4 Setting and adjustment -- 5. How to adjust SERVO (page 4-5).
712	**(ASIX NAME) READY ON ERROR** Velocity control ready signal (VRDY) turned off while position control ready signal (PRDY) is on	Refer to Chapter 2 SERVO page 2-6 of this manual.
713	**(ASIX NAME) READY ON ERROR** Velocity control ready signal (PRDY) turned on while position control ready signal (PRDY) is off	Refer to Chapter 2 SERVO page 2-7 of this manual.
714	**(ASIX NAME) ENCODER DISCONNECT** Encoder detected to have been disconnected	Refer to Chapter 2 SERVO page 2-7 of this manual.
715	**(ASIX NAME) EXCESS ERROR (SERVO OFF)** Position deviation amount at servo off exceeding the allowable maximum value preset by parameter #1806	Refer to Chapter 2 SERVO page 2-8 of this manual.
724	**EMERGENCY BUTTON ON** Emergency stop applied	
725	**EMERGENCY L/S ON** Emergency limit switch turned on	
726	**EMERGENCY STOP BY PLC** Emergency stop applied by PLC	

Number	Message Displayed on the Screen	Treatment
730	**(ASIX NAME) PULSE COUNT MISS (ENC)** Error detected in the pulse counting of the motor encoder	Refer to Chapter 2 SERVO page 2-8 of this manual.
732	**(ASIX NAME) UNFIT ENCODER 1REV. ON (ENC)** One revolution signal of the motor encoder turned on at an abnormal position (number of pulse per revolution is abnormal)	Refer to Chapter 2 SERVO page 2-9 of this manual.
734	**(ASIX NAME) AUTO GAIN OVER** Compensation amount exceeding the possible maximum compensation amount in automatic gain compensation function	Refer to Chapter 2 SERVO page 2-9 of this manual.
735	**(ASIX NAME) NO F/B PULSE** No encoder feedback pulse input/detected	
736	**(ASIX NAME) SERVO ALARM** Alarm detected from the axis control servo unit (AC SERVO M SERIES)	Check which number is indicated on the LED of the SERVO UNIT in the power cabinet behind the machine.
740	**USER DATA ERROR, ABS ENCODER ERR** User data error occurred, or absolute encoder signal disconnected	
741	**OVER CURRENT**	
742	**POWER LINE PHASE CUT** Power line phase cut, instant power failure error	
743	**ABNORMAL POWER F/B**	
744	**ABNORMAL VOLTAGE** Abnormal main circuit voltage	
745	**OVER SPEED** Over speed, pressure detected	ENCODER disconnection
747	**OVERLOAD** Overload, heat sink overheating	

8) SYSTEM ALARM

Number	Message Displayed on the Screen	Treatment
9001	COMMON MEMORY INITIAL CHECK ERROR WITH 0xAA	Turn off power and then turn it on again. If the problem persists, please contact us.
9002	COMMON MEMORY INITIAL CHECK ERROR WITH 0x55	
9003	INITIAL COMMUNICATION ERROR	
9004	PARAMETER INITIAL TRANSLATION ERROR	
9005	COMMON MEMORY INITIALIZE ERROR	
9010	ZERO DIVIDE ERROR HOOK	
9011	NMI HOOK	
9012	INVALID OP CODE INTERRUPT HOOK	
9013	CO_PROCESSOR ERROR HOOK	
9014	GROUP A INTERRUPT HOOK	
9015	GROUP B INTERRUPT HOOK	
9016	GROUP C INTERRUPT HOOK	
9050	INTERRUPT COUNTER CHECK ERROR	
9051	BACKGROUND COUNTER CHECK ERROR	
9052	COMMUNICATION ERROR (MMI TIME OUT)	
9053	COMMUNICATION ERROR (MMI UPDATE ERROR)	
9054	AXIS CONTROLLER STATE ERROR	
9055	NC NORMAL RESTART	
9200	COMMUNICATION ERROR (NC TIME OUT)	
9201	COMMUNICATION ERROR (NC UPDATE ERROR)	
9202	COMMUNICATION ERROR (DIAGNOSIS DATA CHECK SUM ERROR)	
9203	COMMUNICATION ERROR (UPDATE CHECK SUM ERROR)	
9204	COMMUNICATION ERROR (NC MODIFICATION REQUEST ERROR)	
9205	COMMUNICATION ERROR (NC REFERENCE RETURN ERROR)	
9206	NC RESET BY WATCH DOG TIMER	

※ If an ALARM other than the examples above occurs, please contact us.

2.3 Details of the "401 THERMAL SENSOR ALARM"

When the internal temperature of the SENTROL2 main unit exceeds 70℃, this alarm will be displayed.

(How to Release)

When the temperature drops to less than 70℃, the alarm will be automatically released.

	Cause of Trouble	Measures
1	Trouble occurs in the cooling fan in the SENTROL2 main unit	Replace the fan (refer to page 5-2).
2	Trouble occurs in the cooling fan in machine power electric cabinet (cabinet).	Replace the fan.
3	The air filter of the cooling fan in the machine power electric cabinet (cabinet) is clogged.	Clean the air filter.

2.4 Details of the "500 ~ 505 STORED STROKE LIMIT ALARM"

When the machine reaches the stored stroke limit, this message will be displayed.

In case of automatic mode when this alarm is displayed, all axes stop transport. For the manual mode, only the alarmed axis stops transport.

(Cause)

(a) The program was modified.

(b) Set the stored stroke limit correctly.

(How to Release)

(a) The machine can be moved in the reverse direction of its previous moving direction.

(b) If you cannot leave the restricted area, press the Emergency Stop button to release the alarm and move the machine to jog transport by entering G23 (STORED STROKE LIMIT FUNCTION OFF) with MDI.

2.5 Details of the "1000 ~ 2099 Sequence-related Alarms & Numberless Alarms"

In an NC machine, various controls are needed according to the machine structure including moving an axis to a certain position, controlling the spindle for cutting, etc., as well as rotating the spindle and supplying lubricants. This alarm warns the operator of abnormalities related to machine operation.

In general, the details of the alarms and their numbers vary by machine due to the different structures of each machine. For more information, refer to the user's manual or contact the machine maker. This section describes some common release methods when an alarm occurs.

(How to Release)

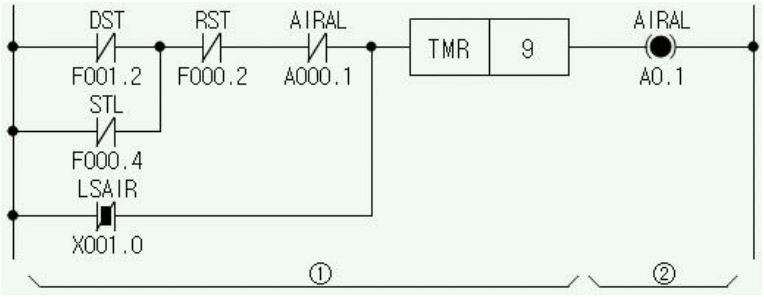
When an alarm related to sequences 1000~2099 or a numberless alarm occurs, the operator should find out where the alarm occurs first.

(a) Enter data in the order of DIAG PLC PLC DIAG Address Being Searched = A 0 [ ] . The following are shown:

```
Address   7 6 5 4 3 2 1 0
A000      0 0 0 0 0 0 1 0
A001      0 0 0 0 0 0 0 0
A002      0 0 0 0 0 0 0 0
   |
   |
A006
Addresses being searched
```

When A000~A024 are displayed, the alarm is generated in the case of "1." In this example, the alarm occurs at A000.1.

(b) Afterward, when entering PLC DIAG followed by data in the order of LAD-DER Search WRITE SYMBOL/ADDRESS A 0 . 1 [↵], for example, data will be displayed as follows:



where part ① is the conditional part and part ② is the result.

The cause of the alarm should be removed after reviewing part ①, because it is due to the part ①.

3. Function and Operation of Alarm History

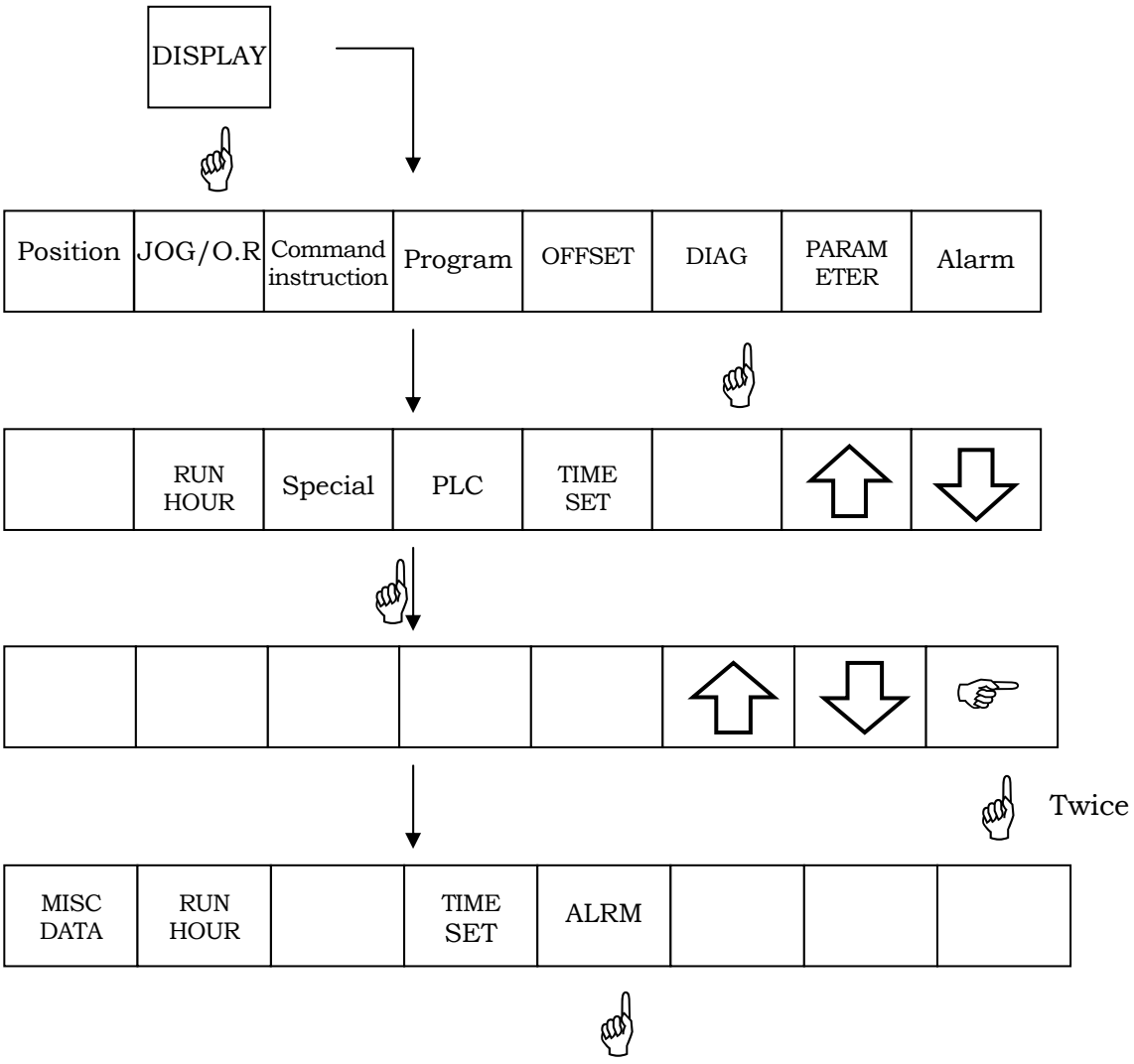
3.1 Functions

Up to 120 alarms generated in the past and 400 keys that have been entered are memorized..

The operation mode, the program number (automatic operation time), and the alarm number time (month, day, hour, and minute) when an alarm occurs are memorized. The time (month, day, hour, and minute) when the power is on is also memorized.

3.2 Displays

1) Select the “Alarm” menu in the “Diagnosis.”



2) The operation mode, program number, alarm number, alarm description, time, and the order of alarms when alarms occur are displayed.

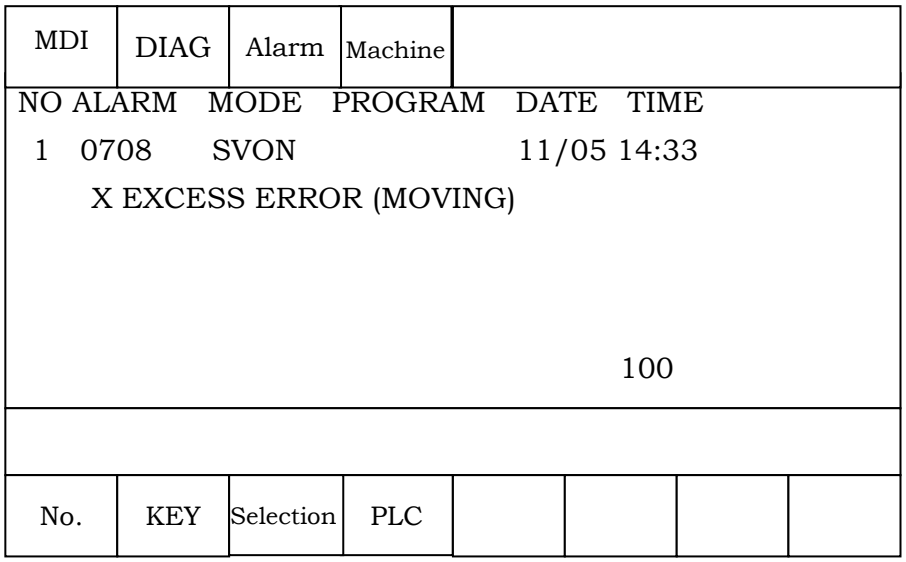


Fig. 1-1 Alarm display

3) Press the Selection key to display the P/S alarm (see page 1-3) and press the key again to display the alarms other than the P/S alarm. When the alarm is P/S alarm, “20” is displayed at the right bottom of the screen; when any alarm other than P/S alarm, “100” is displayed at the right bottom of the screen. “20” and “100” mean the maximum amount of alarms that can be displayed, respectively.

4) Pressing the “KEY” key will display the entered key and the power-on time as shown in Fig. 1-2. The display appears in the time order of the alarm keys displayed. Also, “KEY” is displayed at the right bottom of the screen.

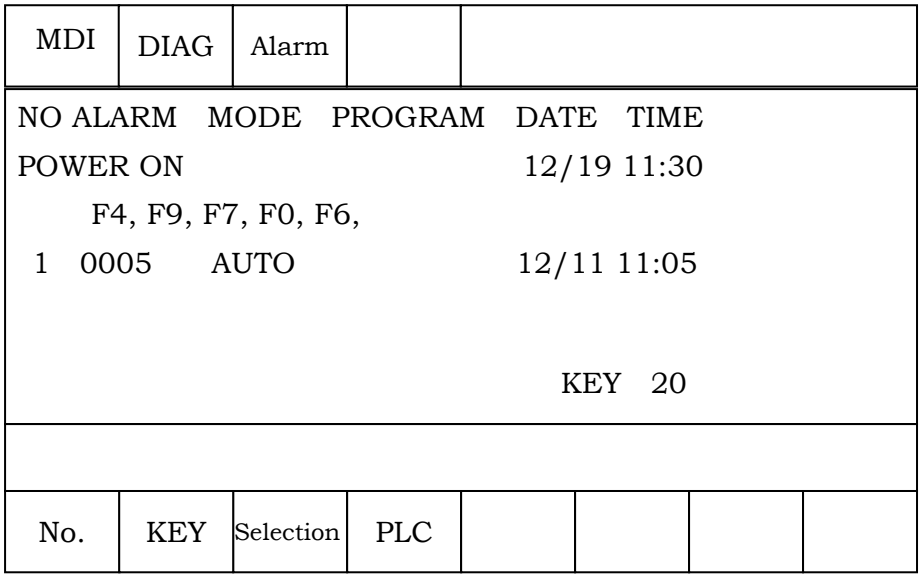


Fig. 1-2 Alarms and key display

5) The following screen appears by selecting the “No.” menu, and entering the alarm number for which a user wants to search displays the alarm number from that designated number.

Alarm = ■

If there is no alarm that is searched for, the following message will be displayed:

“None”

6) Selecting the “PLC” menu will display the PLC screen.

3.3 Symbols

1) Modes

Display	Description
MPG	MDI operation
MDI	MDI mode
JOG	Manual operation
AUTO	Automatic operation
EDIT	Editing
REF	Ref. point return
PWON	Within 5 seconds after power on
DNC	DNC operation

2) Keys

Display	Description
_	'Space' key
OPRT	'Operator's panel' key
;	'END OF BLOCK
BS	' ⇦ ' key
Cancel	'Cancel' key
RSET	'Reset' key
STRT	'CYCLE START' key
Stop	'FEED HOLD' key
CRT	'DISP' key
F1~F8	F1~F8 keys
MODE	'Select' key
PWON	Power ON
LF	' ↵**(ENTER)**' key

4. NC Functions & Malfunction

1) Incapable of Operating with Manual Pulse Generator

Items	Cause of Trouble	How to Verify	Measures
1	Trouble analysis	1. The machine does not work while the current position display moves. 2. Neither the current position display nor the machine does not move.	To the item 2.
2	The machine lock MLK is on.	Confirm the operation panel.	To the item 5.
3	The servo off signal is on.	Verify the PLC diagnosis. Check the G64.6, G84.6, and G74.6.	
4	Abnormality of servo system		
5	Interlock signal	Check the ITX, ITY, and ITZ.	ITX G64.4 ITY G74.4 ITZ G84.4
6	The mode signal is not entered yet.	Verify if the 「handle」 is marked on the status indication of the screen.	PLC diagnosis, F3.1
7	The direction signal of feed axis is not entered yet.	Make sure the axis selecting signal is entered in the handle screen.	
8	Inferior manual pulse generator (MPG) Inferior cables	Check if the contents of the MPA and MPB (page 11/11 No.18) in the diagnosis (general) screen change.	
9	The red LED on the printed board lights up.		Turn the power off and turn on again. When the trouble frequently occurs, do not hesitate to contact us.

2) Incapable of Synchronized Feed (Thread Cutting) Operation

Items	Cause of Trouble	How to Verify	Measures
1	Confirm the number of spindle revolutions.	Verify the trouble by viewing the feed rate screen.	
2	Cable connection error	Confirm the connection between the NC and the position coder.	
3	Inferior position coder	Verify if the contents of the spindle position coder (page 10/11 No.15) in the diagnosis (general) vary.	Replace the position coder.
4	Inferior position coder rotation	When the zero signal of the position coder is incoming, verify if the position at that time is same as that after high-speed rotation of the spindle chuck. (Is the general diagnosis page 11/11 No.20 PCZ 1?)	Check the position coder timing belt, etc.

3) Incapable of Automatic Operation

Items	Cause of Trouble	How to Verify	Measures
1	Trouble analysis	Try to turn the start-up button on/off in auto mode.	
		1. The STL lamp does not light up.	To the item 2.
		2. The spindle does not work while the STL lamp lights up.	To the item 7.
2	The mode signal cannot be input.	Confirm if the 「Automation」 mark is displayed in the screen status indication.	
3	The start signal was not input.	Check the ST signal (G5.0) in the PLC diagnosis.	
4	Quiescence signal of automatic operation (*SP)	Check the *SP signal (G5.0) in the PLC diagnosis.	
5	The reset signal was input.		
6	1. The override is 0%. 2. The start lock and the interlock are on. 3. Perform the inposition check. 4. Wait for spindle rotation by means of feed per revolution 5. Wait for signal indicating arrival at the spindle speed	Check the speed screen. In the case of 0.0 bit INP=0 Check it out in the spindle speed screen. F44.7	

4) Wrong Location of Ref. Point Return

① Deviated by 1 grid.

Items	Cause of Trouble	How to Verify	Measures
1	The position of the deceleration DOG is not good.	After moving the machine from the reference point position to the deceleration DOG direction, observe the deceleration signal using the diagnosis function to read the reference point position and the deceleration DOG position, and the distance between the two positions, at the NC position.	The distance from the departure point of the deceleration DOG to the reference point position shall be equal to approximately 1/2 revolution of the motor.
2	The length of the deceleration DOG is short.	Read the length of the deceleration DOG as set forth in the above item 1.	Refer to the combination manual to change the length of the DOG as needed.

② The stop position was irregularly deviated.

Items	Cause of Trouble	How to Verify	Measures
1	Noise	Make sure the cable shield is grounded and a spark killer is mounted to the solenoid coil. Also, make sure the encoder cable is separated from the cabinet cables.	Earth the cable shield. Install a spark killer. Remove the cable.
2	The power supply voltage of the encoder is low.	Make sure the power supply voltage of the encoder is 4.75V or higher.	Add the power cable of (5V)/0V.
3	The connection between the servo motor and the mechanical coupling is loose.	Check the machine position and the match by attaching marks to the motor axis.	Firmly tighten the coupling.
4	Inferior encoder	Replace the encoder.	Replace the encoder.
5	Inferior EPS3 board	Replace the printed board.	Replace the EPS3 board.

<How to Adjust the Location of Ref. Point Return>

1) Overview

During ref. point return, the relationship between the deceleration DOG and the location of ref. point return is critical.

If the ref. point return is incorrectly done, the stop position will be deviated by one revolution of the motor and it will be impossible to return to the origin exactly. In this section, we will review how to setup the DOG or parameters exactly.

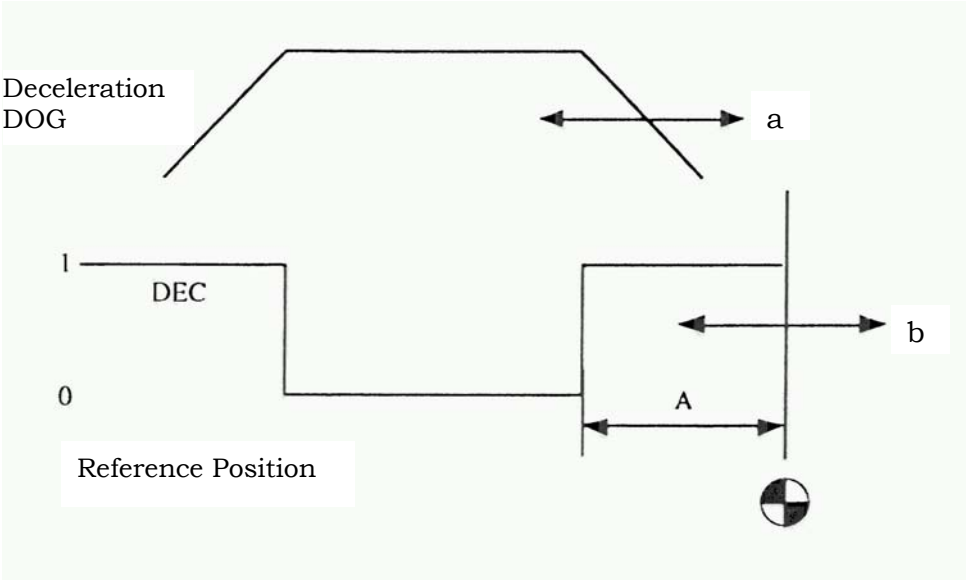
2) How to Confirm the Reference Point Position

For example, the following is how to check the X axis (PARAMETER 1823 DIA=0):

A) Select the X axis in handle mode at the reference point position, press the relative value X0, and then transport the handle in the negative (–) direction until the diagnosis No. 0000 7BIT DEC becomes 0.

B) When DEC becomes 1 by transporting the handle in the positive (+) direction gradually after performing A), check the relative value of the X axis at that position. Optionally, put the value as A (mm).

C) If A (mm) is nearly 0 or same as one revolution of the motor, there must be a problem.



3) Two Methods of Adjusting Zero Position

A) Move the deceleration DOG to make A approximately a half of the transport distance per one revolution of the motor (mm).

B) Increase or decrease the value of the reference point shift parameter, and adjust it to approximately a half of the transport distance per one revolution of the motor (mm). → The reference point position varies depending on the setting value of the parameter. (For more details, refer to “5) How to Shift the Reference Point Position.”)

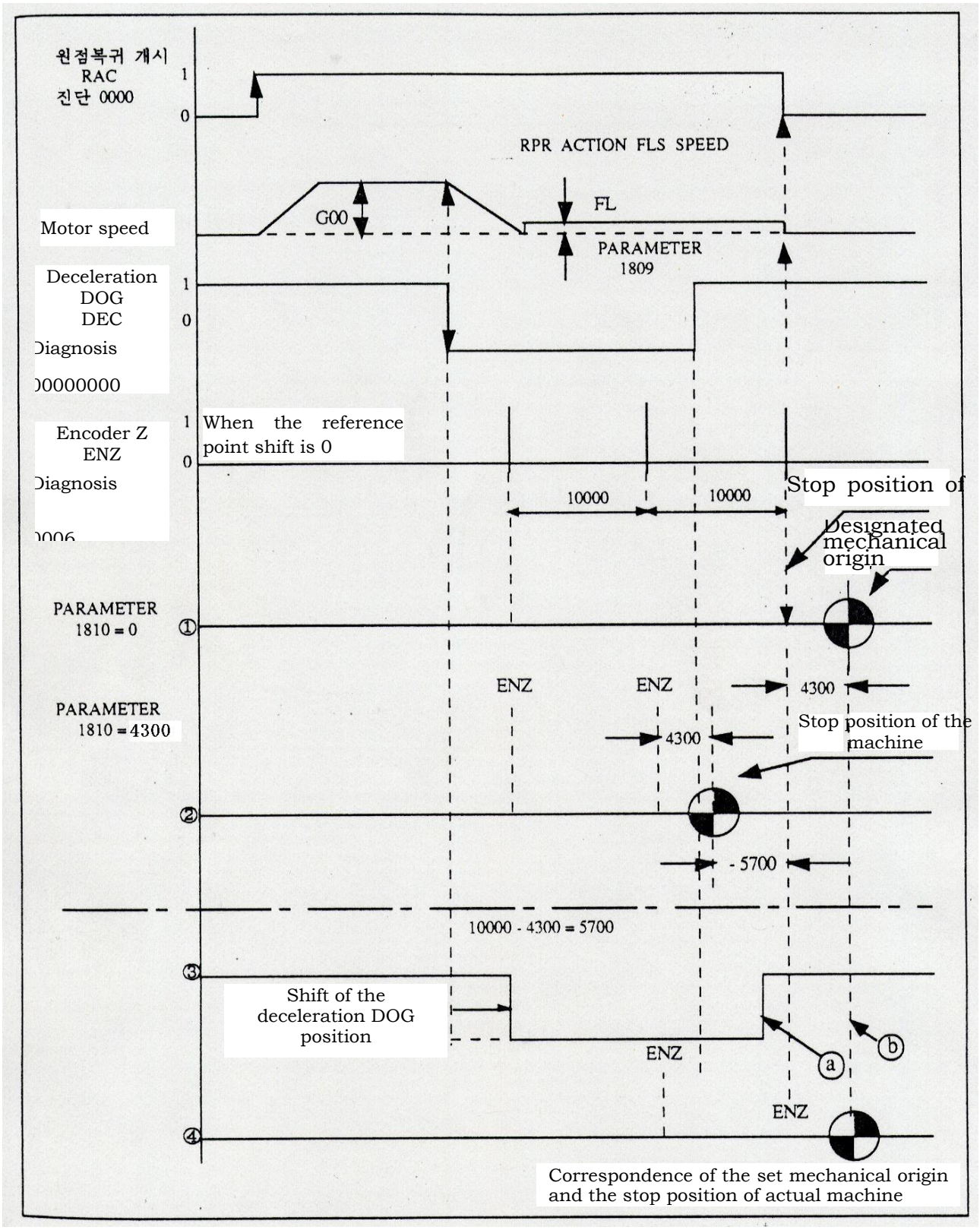


Fig. 1-3 Timing chart of ref. point return

4) Operation Sequence of Ref. Point Return

The ref. point return of the SENTROL2 is the grid shift type.

In the case of the parameter No. 1823 DIA=0, ENCODER PULSE 6000PPR, and 10 mm pitch per revolution:

A) When the parameter No. 1801 RAC of the ref. point return signal becomes 1, the spindle turns towards the rapid G00 speed in the origin direction.

B) The spindle begins to decelerate when the deceleration DOG is on, and it moves at full speed after the acceleration is finished.

C) If the reference point shift is 0 and the deceleration DOG is off, the spindle stops when the ENZ becomes 1.

5) How to Shift the Reference Point Position

A) When attempting to adjust the origin point at the designated origin as shown in Fig. 1-3 ①, use the parameter No. 1810 (RP. SHIFT AMOUNT).

In the case of ①, the setting value of the parameter should be calculated by the unit of pulse because the distance to the designated origin is 4300 ㎛ (operated by the MPG handle).

$$\text{RP.SHIFT AMOUNT(PULSE)} = 4300\ (\mu m) \times \frac{6000 \times 4\ (\text{PULSE})}{10000\ (\mu m)}$$

$$= 10320$$

B) When performing ref. point return as it is, the ENZ is grid-shifted as shown in Fig. 1-3 ②, making the spindle stop at the position of -5700, which is different from the targeted value. That is because the deceleration DOG was off at that position in advance.

C) Thus, move the deceleration DOG to the right as sh0wn in Fig. 1-3 ③, in order to match the designated origin with the machine stop position, as shown in Fig. 1-3 ④.

D) At this moment, the distance between ⓐ and ⓑ should be equal to approximately a half revolution of the motor. When the positions of ⓐ and ⓑ are approached each other, there must be an error of the reference point position as much as one revolution of the motor.

Note) When giving a diameter instruction to the X axis at an NC lathe (SENTROL2-L), the value displayed on the screen (1823, DIA=1) becomes twice as long as the actual distance of the machine movement. Thus, set the DIA of the parameter No. 1823 to 0 only when it is necessary, and be sure to return the value to 1 after the adjustment.

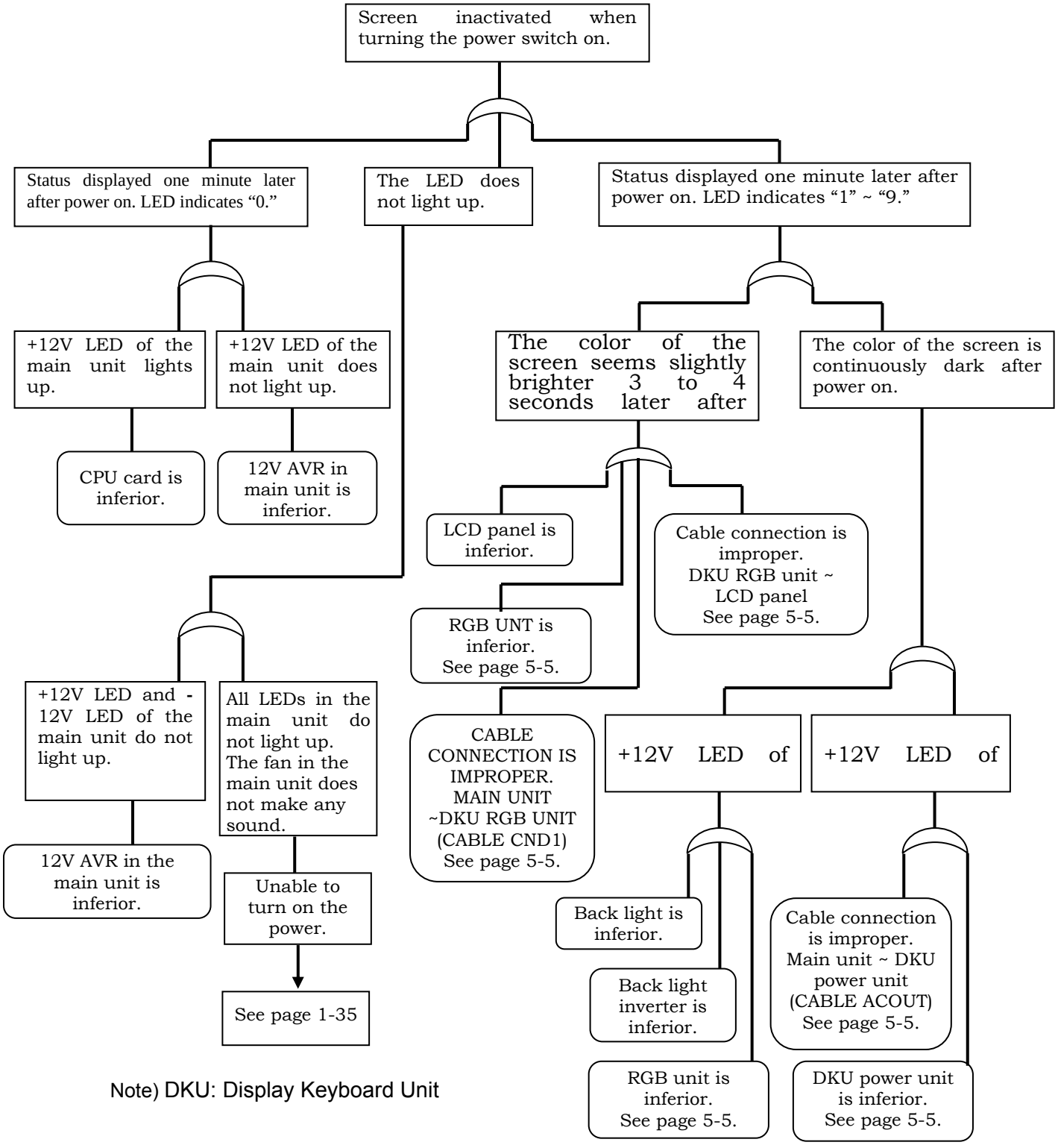
5. Abnormalities on Screen

5.1 Screen Inactivated When Turning Power Switch On

: Present state

: Cause

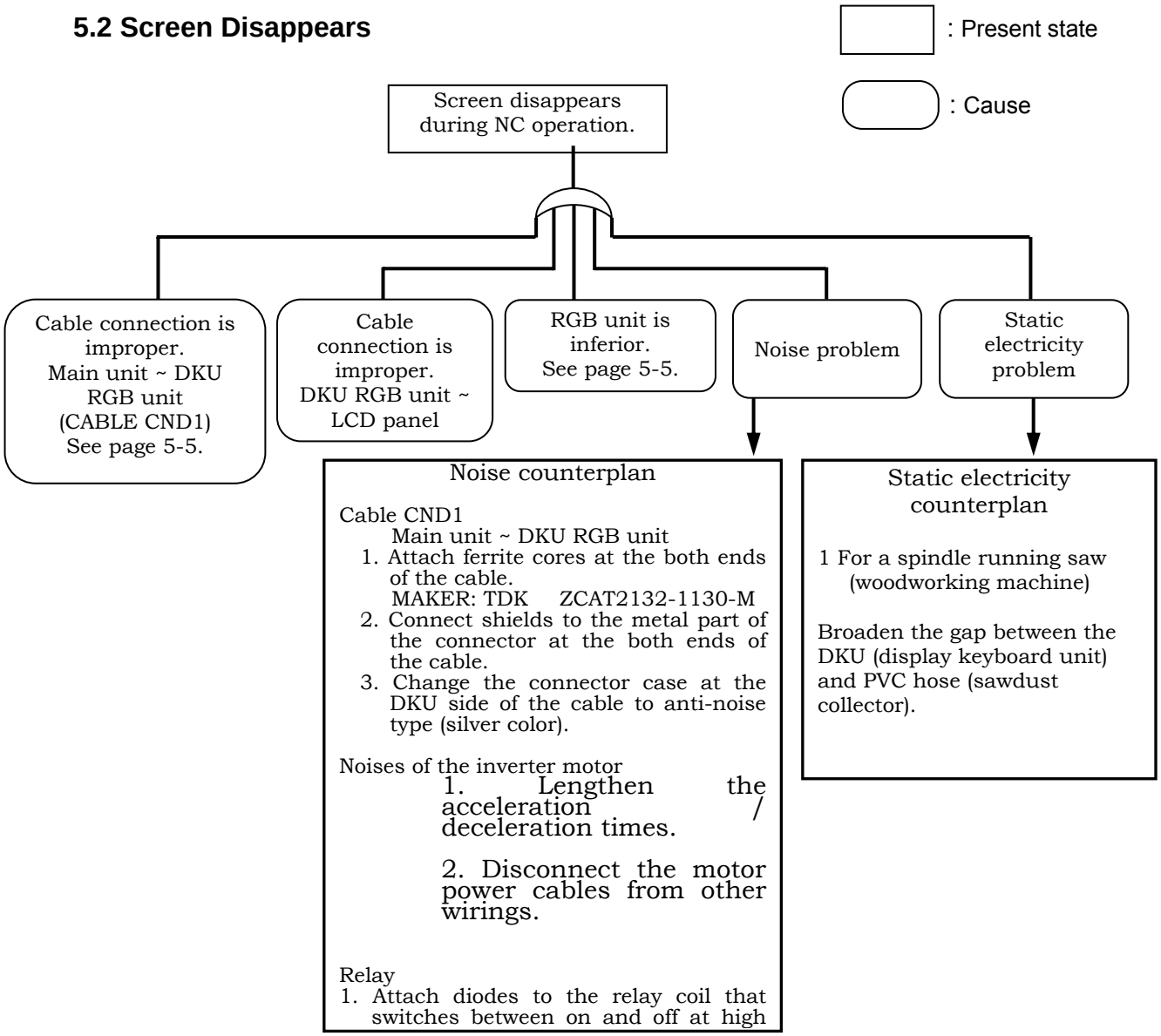
Verify the displayed contents of the LED indicating the status of the main unit. (Refer to page 5-2.)


Screen inactivated when turning the power switch on.
Status displayed one minute later after power on. LED indicates "0."
The LED does not light up.
Status displayed one minute later after power on. LED indicates "1" ~ "9."
+12V LED of the main unit lights up.
+12V LED of the main unit does not light up.
The color of the screen seems slightly brighter 3 to 4 seconds later after
The color of the screen is continuously dark after power on.
CPU card is inferior.
12V AVR in main unit is inferior.
LCD panel is inferior.
Cable connection is improper. DKU RGB unit ~ LCD panel See page 5-5.
RGB UNT is inferior. See page 5-5.
+12V LED and -12V LED of the main unit do not light up.
All LEDs in the main unit do not light up. The fan in the main unit does not make any sound.
CABLE CONNECTION IS IMPROPER. MAIN UNIT ~DKU RGB UNIT (CABLE CND1) See page 5-5.
+12V LED of
+12V LED of
12V AVR in the main unit is inferior.
Unable to turn on the power.
Back light is inferior.
Cable connection is improper. Main unit ~ DKU power unit (CABLE ACOUT) See page 5-5.
Back light inverter is inferior.
See page 1-35
RGB unit is inferior. See page 5-5.
DKU power unit is inferior. See page 5-5.

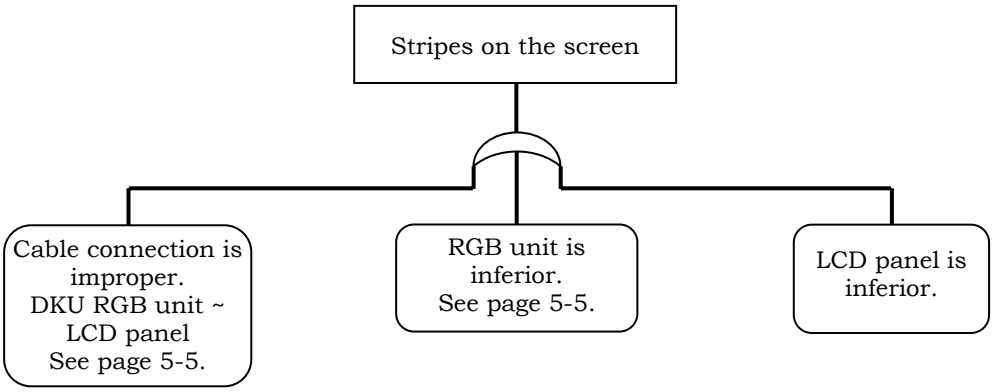
Note) DKU: Display Keyboard Unit

SENTROL®

5.2 Screen Disappears

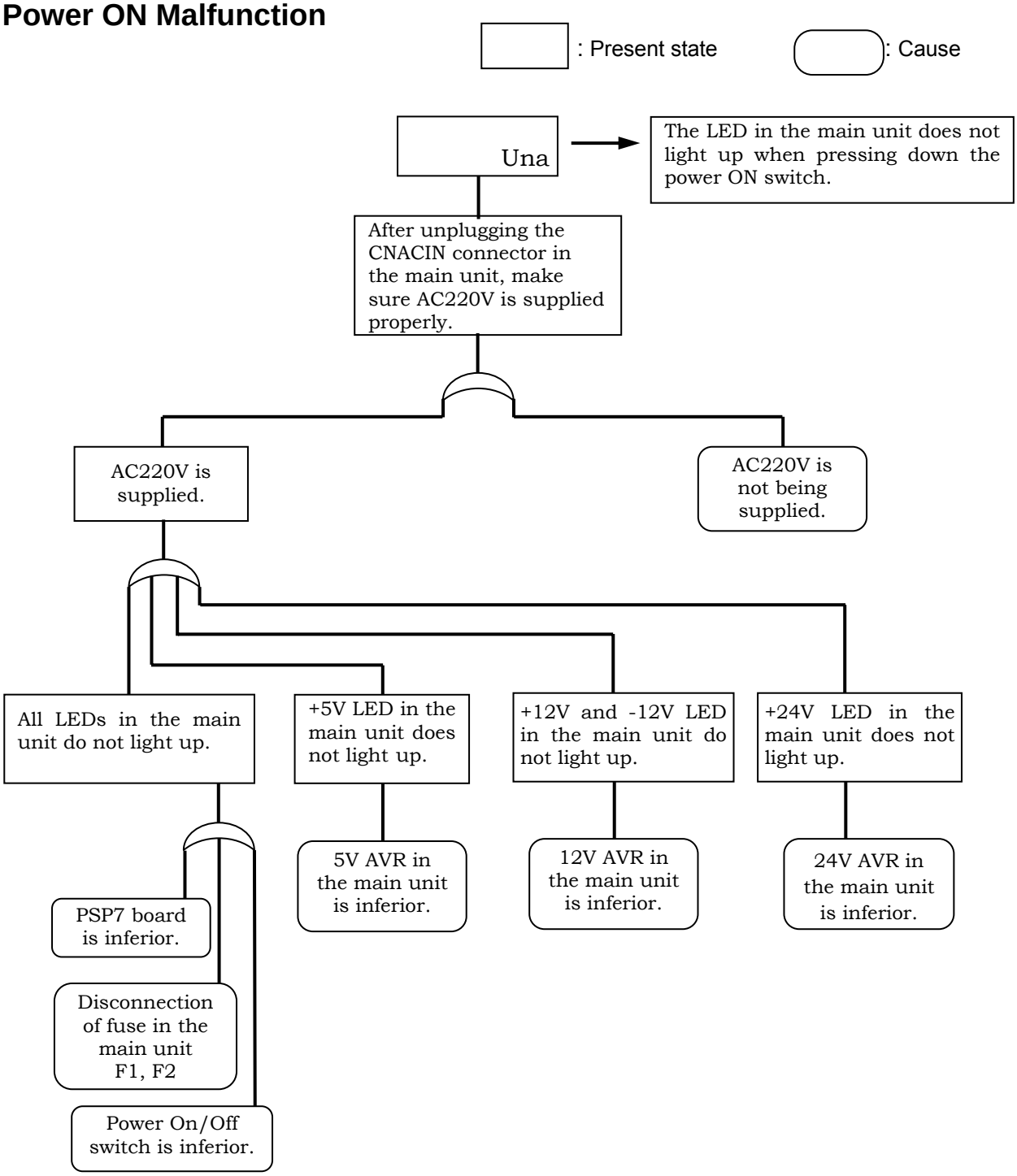

: Present state
: Cause
Screen disappears during NC operation.
Cable connection is improper. Main unit ~ DKU RGB unit (CABLE CND1) See page 5-5.
Cable connection is improper. DKU RGB unit ~ LCD panel
RGB unit is inferior. See page 5-5.
Noise problem
Static electricity problem
Noise counterplan
Cable CND1
Main unit ~ DKU RGB unit
1. Attach ferrite cores at the both ends of the cable.
MAKER: TDK ZCAT2132-1130-M
2. Connect shields to the metal part of the connector at the both ends of the cable.
3. Change the connector case at the DKU side of the cable to anti-noise type (silver color).
Noises of the inverter motor
1. Lengthen the acceleration / deceleration times.
2. Disconnect the motor power cables from other wirings.
Relay
1. Attach diodes to the relay coil that switches between on and off at high
Static electricity counterplan
1 For a spindle running saw (woodworking machine)
Broaden the gap between the DKU (display keyboard unit) and PVC hose (sawdust collector).

5.3 Stripes on the Screen


Stripes on the screen
Cable connection is improper. DKU RGB unit ~ LCD panel See page 5-5.
RGB unit is inferior. See page 5-5.
LCD panel is inferior.

Note) DKU: Display Keyboard Unit

6. Power ON Malfunction


: Present state
: Cause
Una
The LED in the main unit does not light up when pressing down the power ON switch.
After unplugging the CNACIN connector in the main unit, make sure AC220V is supplied properly.
AC220V is supplied.
AC220V is not being supplied.
All LEDs in the main unit do not light up.
+5V LED in the main unit does not light up.
+12V and -12V LED in the main unit do not light up.
+24V LED in the main unit does not light up.
PSP7 board is inferior.
Disconnection of fuse in the main unit F1, F2
Power On/Off switch is inferior.
5V AVR in the main unit is inferior.
12V AVR in the main unit is inferior.
24V AVR in the main unit is inferior.

7. Communication Troubles

Present state: ① In spite of trying to enter the program in edit mode from an external device, the length of entered tape is not displayed while the message “being entered” is flickering on the screen.

② The operator tried to operate the DNC, but the number indicating the length of entered tape remains as ‘0.00 m’ and does not change, while the message “being entered” is flickering on the screen.

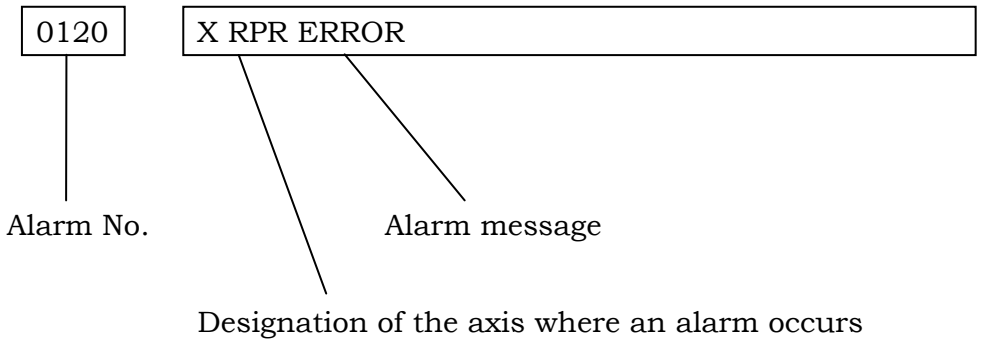
③ In spite of trying to output the program in edit mode from an external device, it is impossible to input the program into the PC, while the message “being output” and the length of the tape are displayed on the NC screen.

Items	Cause of Trouble	How to Verify	Measures
1	Improper cable wiring	Check the cable wiring.	
2	Parameter setting error	Make adjustment between the communication device and the parameters of the SENTROL2.	Refer to Appendix 14 of this manual (pages 9-19).
3	No ‘%’ signal at the head of the program.	1) Is there the ‘%’ signal at the head of the program? 2) Is the software one to whose head the ‘%’ signal is attached during communication, even when the signal does not exist at the head of the program?	Refer to Appendix 14 of this manual (pages 9-18).
4	Telecommunication ICs in trouble	Check the connector voltage of the SENTROL2 side (25PIN connector /9PIN connector) (Normal voltage) SD (2PIN/3PIN)] - 8 ~ - 12V SG (7PIN/5PIN)] RD (3PIN/2PIN)] 0V ~ 0.5V SG (7PIN/5PIN)] RS (4PIN/7PIN)] - 8 ~ - 12V SG (7PIN/5PIN)] CS (5PIN/8PIN)] 0V ~ 0.5V SG (7PIN/5PIN)]	Possibility of IC trouble when the voltage is not normal. (Needs to replace the CPU card.) ↓ Please contact us.

Chapter 2 Servo

1.Servo-related NC Alarms (Details)

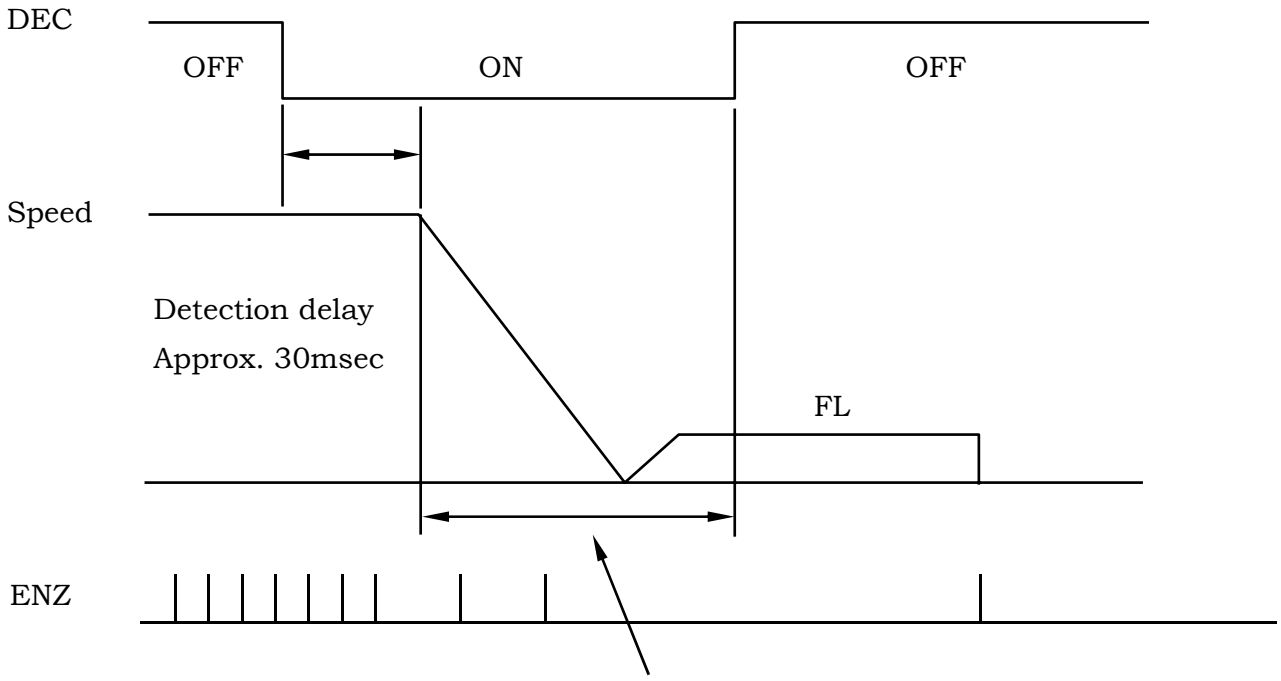
(1) Display Format of Alarms



The designation of an axis can be configured by the parameter “1020 NAME OF EACH AXIS.” However, the setting range is marked as “ □ ” for the axis designation in the 65 ~ 90 (A ~ Z) manual.

0120	□ RPR ERROR

When one revolution signal (ENZ) has been never detected for the deceleration switch (diagnosis No.0000 DEC) from ON to OFF during returning to the origin (for diagnosis No.0000 RAC = 1), this alarm will be displayed.



Items	Cause of Trouble	How to Verify	Measures
1	Too high speed	When an alarm occurs at the rapid traverse rate, RT0 When the ref. point return is done at RT1 and RT2 to result in a normal status	Reduce the speed. Lengthen the deceleration DOG.
2	Location of return start is too close.	Check the distance between the location of return start and the origin.	Execute the return at the position away more than the distance as long as 2 revolutions of the motor from the origin.
3	The power supply voltage of pulse coder is too low.	The voltage of the pulse coder should be 4.75V or higher.	Have the sum of the voltage drop introduced by the cable less than 0.2V for both 5V and 0V
4	Pulse coder inferiority	Replace the pulse coder.	Replace
5	Inferiority of EPS3 board	Replace the EPS3 board.	Replace

ENZ is found at the diagnosis “0006 ENZ.”
When using a linear scale, the origin signal should be adjusted so that it can be detected for the deceleration switch from ON to OFF. The origin signal of the linear scale can be seen at the diagnosis “0006 ENZ.”
It is possible to see if a one revolution signal and origin signal of the linear scale are entered via the diagnosis “0005 ENCODER CTR SKIP.” That is because the latched value of the position counter by the signal is displayed. The time when the display is changed is when the signal is input.
To release the alarm, switch on the reset key.

0707 □ EXCESS ERROR (STOP)

Position variation amount upon stop was too large.
Comparing the values of the position variation amount upon stop (diagnosis “0002 POSITION ERR”) and the parameter “1804 STOP POS ERR LIMIT,” when the position variation amount exceeds the set value, the alarm occurs.
To release this alarm, turn the emergency stop switch on or off. However, the parameter “1823 ERC = 1” or the position variation amount should be lower than the set value.

Items	Cause of Trouble	How to Verify	Measures
1	Setting error of position variation amount	Make sure the content of the parameter 1804 accords with the parameter table attached to the NC.	Set the parameter correctly.
2	Undershoot	If the current needed to accelerate or decelerate the motor at the acceleration or deceleration time of the NC does not flow, the amount of position control circuit errors is temporarily increased.	Lengthen the time constant of NC acceleration or deceleration.
3	Abnormal power supply voltage	Verify the voltage of control part.	Put any inferior parts in order.
4	Poor connection	Check the connections including the encoder cord, motor power cord, etc. Especially, check if there is any bad contact of the encoder signal lines or the signal lines on A and B are not reversely connected. (Check the attachment direction for encoder separately mounted.	Put any inferior parts in order.
5	Troubles of EPS3 board and servo AMP printed board, the position control parts	Replace a spare printed board if available to verify. At this time, make sure to adjust and set anything correctly.	Replace the printed board.

0708 □ EXCESS ERROR (MOVING)

Position variation amount upon movement was too large.

Comparing the values of the position variation amount upon movement (diagnosis "0002 POSITION ERR") and the parameter "1805 MOVING POS ERR LIMIT," when the position variation amount exceeds the set value, the alarm occurs.

To release this alarm, turn the emergency stop switch on or off. However, the parameter "1823 ERC = 1" or the position variation amount should be lower than the set value.

Items	Cause of Trouble	How to Verify	Measures
1	Setting error of position variation amount	Make sure the content of the parameter 1805 accords with the parameter table attached to the NC.	Set the parameter correctly.
2	Overshoot	If the current needed to accelerate or decelerate the motor at the acceleration or deceleration time of the NC does not flow, the amount of position control circuit errors is temporarily increased.	Lengthen the time constant of NC acceleration or deceleration (set at the control part).
3	Abnormal power supply voltage	Verify the voltage of control part.	Put any inferior parts in order.
4	Poor connection	Check the connections including the encoder cord, motor power cord, etc.	Put any inferior parts in order.
5	Troubles of EPS3 board and servo AMP printed board, the position control parts	Replace a spare printed board if available to verify. At this time, make sure to adjust and set anything correctly.	Replace the printed board.

0709 □ DRIFT OVER

When the amount of drift compensation (parameter 1822) or the value of the diagnosis "0013 DRIFT" for automatic drift compensation (parameter "1823 ADF = 1") is more than ±1632, the alarm occurs.

To release this alarm, turn the emergency stop switch on or off.

Items	Cause of Trouble	How to Verify	Measures
1	Bad servo adjustment	Make sure the servo adjustment has been properly performed.	Adjust the servo correctly.
2	Conflict between machines	Verify via the alarm history, etc.	Turn off the power, and then turn on.
3	Drift accumulated for a long time	Uptime of machines, etc.	Readjust the servo.
4	Bad servo unit		Replace the servo unit.
5	Inferior EPS3 printed board		Replace the EPS3 board.

0712 □ READY OFF ERROR

The V-READY is still off (diagnosis “0007 bit2=1”) even though the P-READY (diagnosis “0007 PRD”) is on.

Turn on the reset key to release the alarm after eliminating the cause.

If the parameter “1815 VOC = 1,” the alarm is cancelled.

Items	Cause of Trouble	How to Verify	Measures
1	AC 220V power supply failure or undervoltage to the servo unit.	Make sure that the magnet contactor and the relay for the servo unit are ON, and then measure the voltages between R, S, and T and between r and t of the servo unit.	Eliminate a root cause including connection error, etc.
2	Power supply failure or undervoltage to the coils of the magnet contactor and relay for the servo unit.	Make sure that the magnet contactor and the relay for the servo unit are not ON, and then check the coil voltage.	Eliminate a root cause including connection error, etc.
3	Inferior magnet contactor and relay		Replace the magnet contactor and the relay
4	Problems on the sequences	Check the sequences	Eliminate a root cause.
5	The servo unit is inferior.		Replace the servo unit.
6	The EPS3 board is inferior.		Replace the EPS3 board.

0713 □ READY ON ERROR

V-READY is still ON (diagnosis “0007 bit2 = 1”) even though the P-READY is OFF (diagnosis “0007 PRD”).
To release the alarm, make the reset key ON by eliminating the cause.
When the parameter “1815 VOC = 1,” the alarm will be cancelled.

※ This alarm rarely occurs; however if it is the case, the cause may be the troubles of the magnet contactor or the relay.

0714 □ ENCODER DISCONNECT

Disconnection of the encoder signal, phase A and phase B, and the ZERO signal line
To release the alarm, make the reset key ON by eliminating the cause.

The encoder signal can be seen in a general diagnosis.

Diagnosis No. 0006 ENA: Phase A signal
ENB: Phase B signal
ENZ: ZERO signal 1: ON

Items	Cause of Trouble	How to Verify	Measures
1	Improper cable connection	Verify the connection and wiring of the encoder return cables.	Correct the cable connection and wiring.
2	Inferior EPS3 board		Replace the EPS3 board.
3	Inferior encoder of the servo motor		Replace the motor or the encoder.

0715 □ EXCESS ERROR (SERVO OFF)

Position variation amount upon servo off was too large.

Comparing the values of the position variation amount upon servo off (diagnosis "0007 PRD = 1, EBL = 0") and the parameter "1806 SERVO OFF POS ERR LIMIT," when the position variation amount exceeds the set value, the alarm occurs.

To release this alarm, turn the emergency stop switch on or off. However, the parameter "1823 ERC = 1" or the position variation amount should be lower than the set value.

The alarm can be cancelled by setting the parameter to "1815 SOC = 1."

※ The cause of this alarm is a big movement of the spindle by an external force or collision in servo off condition.

0730 □ PULSE COUNT MISS (ENC)

A count error occurred at the counter for position feedback of the encoder.

The amount of count error is displayed on the diagnosis "0012 PULSE COUNT MISS."

The alarm check function will be in effect after the completion of ref. point return. The alarm check is overridden by setting the parameter to "1815 F1C = 1."

To release the alarm, make the reset key ON.

Items	Cause of Trouble	How to Verify	Measures
1	Parameter setting error	Is the parameter No. 1824 zero pulse with a correct value? (Yaskawa servo: Standard 4)	Reset
2	The encoder of the servo motor is inferior.		Replace the motor or encoder.
3	Count error by noise	Verify the earth cable of the motor, the shield of the encoder cable, etc.	Eliminate a root cause.

0732 □ UNFIT ENCODER 1REV. ON (ENC)

The number of generated pulses per revolution of the encoder 1 is incorrect. The number that is determined as abnormal will be displayed on the diagnosis "0013 ENC 1REV PULSE." The display will not disappear until the reset key is on.
When the parameter is set to "1815 F1C = 1," this function will be cancelled.

Items	Cause of Trouble	How to Verify	Measures
1	Parameter setting error	Is the parameter No. 1801 encoder type a correct value? (Yaskawa servo: Standard 4)	Reset
2	The encoder of the servo motor is inferior.		Replace the motor or encoder.
3	Count error by noise	Verify the earth cable of the motor, the shield of the encoder cable, etc.	Eliminate a root cause.

0734 □ AUTO GAIN OVER

The amount of automatic gain compensation was too large. To release the alarm, make the reset key ON.

Items	Cause of Trouble	How to Verify	Measures
1	Servo adjustment is bad.	Was the servo adjusted in a proper way?	Make the adjustment of the servo.
2	Servo unit is inferior.		Replace the servo unit.
3	EPS3 board is inferior.		Replace the EPS3 board.

0736 □ SERVO ALARM

Check to see which number is displayed on the LED of the servo unit.
Refer to the subsequent pages of this manual to verify alarms and take appropriate measures.

Chapter 3 Spindle

1. How to Troubleshoot

1.1 Checkpoints for Troubles

When any troubles occur in the control unit, check the following items first:

① Verify which alarm is indicated by the controller alarm. Also, check the past alarms in alarm mode of the indicator.
② For fusing, which phase is it out of R, S, or T phase?
(Control circuit input FUSE F1, F2, F3)
③ Is there any possibility for reoccurrence of breakdown or abnormality?
④ Are the ambient temperature and the temperature in the power electric cabinet normal?
⑤ Accelerating or decelerating? Or is the machine being driven at normal speed? What about the speed at that moment?
⑥ Is there any difference between forward rotation and reverse rotation?
⑦ Has been there any instantaneous electricity failure?
⑧ Does the trouble occur during a certain operation or instruction?
⑨ How often the trouble occurs?
⑩ Does this trouble occur when the load is weighted or reduced?
⑪ Have you ever tried to replace the troubled parts or take an appropriate emergency measure?
⑫ How many years have passed since beginning the operation?
⑬ Is the power supply voltage normal? Or is it changed largely according to time?

1.2 Step 1

Check the following items as the first step of troubleshooting:

(1) Power supply voltage: 200V + 10% -15%, 50/60Hz, 210V, 220V +10% -15%, 60Hz.
Especially, make sure not to lower the power supply voltage below 200V –15% for just a moment.

Ex) ① The voltage drops at a certain time every day.
② The voltage drops when a certain machine is being operated.

(2) Is the control function around the controller normal?

Ex) ① Are the NC and the sequence circuit normal?
② Is there any abnormalities in the parts, wirings, etc. by examining with the unaided eye?

(3) Is the ambient temperature of the controller (in-plate temperature) 55℃ or less?

(4) Is there any abnormality in the external appearance of the controller?

Ex) ① Damage by a fire or abnormality of card parts and pattern
② Loose wiring, damages, intermixture of foreign substances, etc.

(5) Are all of the DC power supply outputs of SF-PW rated voltage?

When verifying the conditions described above enough, it is possible to determine how much abnormalities have occurred in which parts.

The following shows a rough classification of the troubles of FR-SF:

Fixed classification A

- The controller does not work normally even when providing the power supply to the controller for the first time. (Ⅰ)
- The operation was suddenly stopped although it has shown normal status until now. (Ⅱ)
- Sometimes it does not work normally. The stop position of the orient is deviated.
  An alarm is displayed. (Ⅲ)

Fixed classification B

- Controller trouble
  - Abnormality in the main circuitry
  - Abnormality in the control circuit
- Abnormality in detector
  - Abnormality in the encoder for detecting speed
  - Abnormality in the encoder for multipoint orient
  - 1 Abnormality in the magnet sensor for point orient
- Abnormality in the parameters from the NC and transferred data
- Abnormality in the power supply
- Abnormality in the motor
- Other abnormalities (Shortage of input signal conditions, cable disconnection, etc.

Chapter 4 Setup & Adjustment

1. Inspection & Adjustment When Installing NC

When mounting an NC, perform inspection and adjustment according to the following procedures. For more information, refer to the remarks in the table below:

No.	Description	Remarks
1	Inspect the appearance of the NC main unit, DKU, and servo unit.	Refer to (1).
2	Make sure the terminal fixed by screws is completely connected.	Refer to (2).
3	Connect external cables.	Refer to (3).
4	With turning the power supply for NC off, connect the power supply input cable.	Refer to (4).
5	Make sure the connection position of the connector is correct.	Refer to (5).
6	Verify the settings.	Refer to (6).
7	Verify the input power supply voltage and frequency.	Refer to (7).
8	Check to see if the output voltage is short with the earth.	Refer to (8).
9	Supply the power to the system and check the output voltage.	Refer to (9).
10	Verify the interface signal between the NC and the machine.	Refer to (10).
11	Verify various parameters and setting data.	Refer to (11).
12	Turn the power off.	Refer to (12).
13	Connect the motor power cable.	Refer to (13).
14	Turn the power on.	Refer to (14).
15	Examine the movement of each spindle by means of manual transport.	Refer to (15).
16	Adjust the servo system.	Refer to (16).
17	Make sure all of the NC functions work normally.	Refer to (17).

(1) Inspect the appearances of the NC main unit, DKU, and servo unit.

① Whether there is any dirt or damage on the manual operator's panel within the operator's panel box;

② Whether the attachment of the printed board, the servo unit, etc. in the power electric cabinet is loose or missed; and

③ Whether the cables in the power electric cabinet are damaged (e.g., wire coat peeled off)

(2) Make sure the terminal fixed by screws is completely connected.

① Terminal block of transformer (primary and secondary sides)

② Inspect the status of attachment and damage for the cover part (acryl plate) of each terminal block.

(3) Connect external cables.
Make sure that:

① A protective earth cable with enough thickness not less than 14 ㎟ between the NC and the power electric cabinet of the machine side is connected;

② The protective earth is a single point earth type which is connected from the power electric cabinet of the machine side to the grounding;

③ All of the signal cables are collectively shielded; and

④ The cable specification complies to the applied manuals for:

ⓐ the motor signals; ⓑ the motor power; ⓒ the servo unit interface;

ⓓ the position coder; ⓔ the spindle analog output; ⓕ the manual pulse generator;

ⓖ the DKU; ⓗ the RS232C interface; and ⓘ the PLC DI/DO

(4) With the NC power supply off, connect the power input cable.

① On this occasion, make sure to unplug the motor power cord.

(5) Make sure the connection positions of the connectors are correct:

① Whether the Dsub connector is fixed using clamping screws, and

② Whether the MOLEX connectors (CNACIN, CNACOUT) are firmly fixed.

(6) Verify the settings.

① Setting up the power supply transformer terminal

② Setting up the AC servo unit on the printed board

③ Setting up the AC spindle servo unit on the printed board

(7) Verify the input power supply voltage and frequency.

① Make sure the input power supply voltage meets the following specification:

AC 220V ±10% 50/60Hz ±Hz 1Ø

② Make sure the capacity of the input power supply for the power consumption of the NC main unit and the servo unit is sufficient.

(8) Make sure the output voltage is not short with the earth.

① Make sure each output voltage of the power supply unit is not short with 0V:

ⓐ +5V and 0V ⓑ +24V and 0V ⓒ +12V and 0V

ⓓ −12V and 0V

(9) Verify the output voltage after supplying power.

① Make sure each power supply output at the corresponding check pin of the DIO3 board falls within the range described in the table below:

Designation of voltage output	Rated voltage	Allowable voltage range	Measuring location
P5V	+5V	+5.0~+5.1V	The P5V check pin of the DIO3 board and screws of the main unit
P12V	+12V	+12.0~+12.5V	The P12V check pin of the DIO3 board and screws of the main unit
N12V	−12V	−12.0~−12.5V	The N12V check pin of the DIO3 board and screws of the main unit

(10) Verify the interface signals between the NC and the machine side.

① Refer to the summary table of diagnosis functions.

(11) Verify various parameters and setting data.

① Refer to the parameter summary table.

(12) Turn the power off.

(13) Connect the motor power cord.

(14) Turn the power on.

① In the case of alarm occurred, handle the alarm according to the alarm summary table.

② After repeating power on/off and emergency stop function several times, make sure the motor does not rotate.

(15) Examine the movement of each spindle by manual transport.

① Move the spindle 10 ㎛ by 10 ㎛ by means of manual pulse transport or incremental transport. At this moment, verify if the machine moves accurately.

② Verify if the machine stops accurately when detecting the emergency L/S on alarm by moving to low override in manual jog transport and intentionally operating the limit switch installed to the machine.

③ Make sure alarms indicating excessive error even at the highest transport speed appear, by means of varying and moving the manual jog transport and manual transport override.

(16) Check the servo system.

① While automatically operating a simple program, verify if the value of the position loop gain displayed in the general diagnosis (diagnosis number 014) falls within 0.5% of the set value (parameter No.1803).

(17) Verify if all of the NC functions are normally operated.

① Perform ref. point return.

② Set the amount of grid shift. It will be in effect only when turning the power off once after the setting and turning the power on again.

③ Conduct continuous operation test according to the test program suitable for the machine.

2. Validation & Adjustment of Power Supply Voltage

2.1 Validation of Input Voltage

Verify if the input voltage meets the specification below.
(Check the voltage between the CNACIN pin 1 and pin 3 of the main unit connector.)

AC 220V ±10 % 50/60Hz ±1 % 1Φ

2.2 Fuse

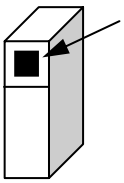
There exist three fuses in the SENTROL2 main unit.

F1, F2 Fuses for AC220V power supply input (DAITO HP50 AC250V 5A)

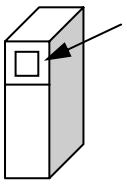
F3 Fuse for +24V power supply (DAITO MP20 2A)

Check the condition of the above fuses and replace any that is short.
Be sure to replace an equivalent fuse.

How to determine whether a fuse is short



Normal



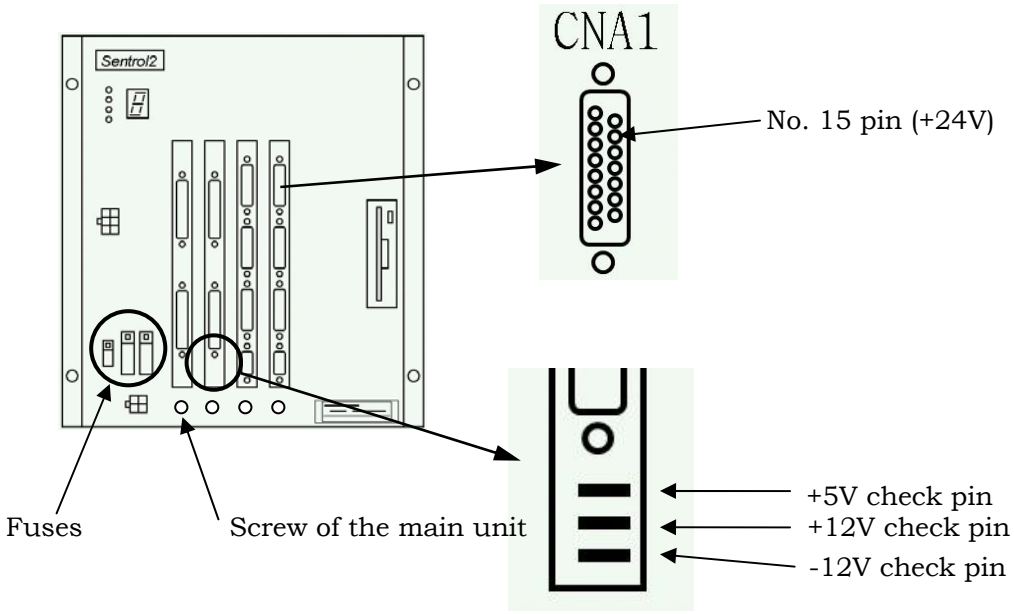
Short

2.3 Validation of DC Voltage

The followings show how to measure the DC power supply voltage in the SENTROL2 main unit:

Designation of voltage output	Rated voltage	Allowable voltage range	Measuring location
P5V	+5V	+5.0~+5.1V	The P5V check pin of the DIO3 board and screws of the main unit
P12V	+12V	+12.0~+12.5V	The P12V check pin of the DIO3 board and screws of the main unit
N12V	−12V	−12.0~−12.5V	The N12V check pin of the DIO3 board and screws of the main unit
P24V	+24V	+23.5~+25.5V	The No. 15 pin of the CNA1 connector on the EPS3 board and screws of the main unit

Measuring points for DC power supply voltage



3. Volume of Each Printed Board

3.1 Overview of Volume Deployment of SENTROL2

The SENTROL2 has volumes as follows:

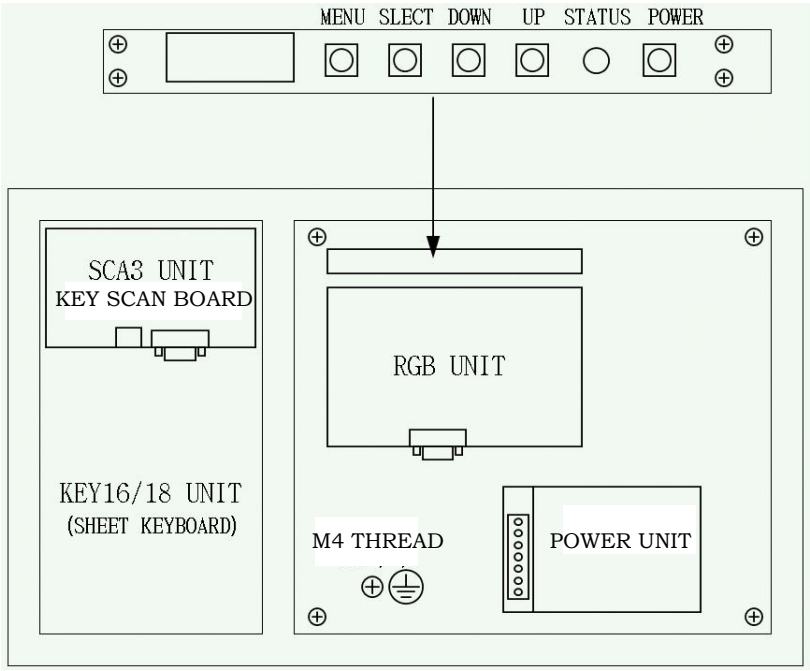
Board name	Volume name	Function of volume
BKP4	VR2	Set the voltage at which an alarm occurs when the power supply voltage drops.
EPS3	VR1	D/A output offset (common in 4 axes)
RIO1	VR1	Set the power supply voltage (+5V)
RIO2	VR1	Set the power supply voltage (+5V)
RAD1	VR1	A/D 0V adjust
	VR2	A/D gain
	VR3	Set the power supply voltage (+5V)

Adjusting after shipping is prohibited since the factory-settings are appropriately fixed when shipping.

4. How to Adjust Screen

4.1 TFT LCD

A. Location of Screen Adjustment Switches



Rear panel of DKU (Display/Keyboard Unit)

B. Functions of Screen Adjustment Switches

Switch name	Functions of switch
MENU	Button to show the screen adjustment menu on the screen
SELECT	Button to select a menu and move to the previous screen **(Automatic screen adjustment)**
DOWN	Button to move downwards Decrease the adjustment value.
UP	Button to move upwards Increase the adjustment value.
POWER	Power (screen) ON/OFF button

C. Shortcut Button

Automatic screen adjustment	DOWN button

Pressing the DOWN button once will adjust the screen indication location automatically.

5. How to Adjust Servo

5.1 Parameter Setting

A) Parameter Setting

Refer to the following table to set the maintenance parameters of the SENTROL2 setup screen and the servo unit:

Example of Setting Parameters

	YASKAWA SIGMA			LG FDA-5000		
Rated RPM	1000 rpm	1500 rpm	3000 rpm	1000 rpm	2000 rpm	3000 rpm
Maximum RPM	2000 rpm	3000 rpm	4500 rpm	2000 rpm	3000 rpm	5000 rpm
SENTROL2 parameters	NO.1803 3000	NO.1803 3000	NO.1803 3000	NO.1803 3000	NO.1803 3000	NO.1803 3000
	NO.1807 5000 (mV)	NO.1807 3334 (mV)	NO.1807 2223 (mV)	NO.1807 5000 (mV)	NO.1807 3334 (mV)	NO.1807 2000 (mV)
Servo unit parameters	CN-03 200 (rpm)	CN-03 300 (rpm)	CN-03 450 (rpm)	P3-13 2000(rpm)	P3-13 3000(rpm)	P3-13 5000(rpm)

	PANASONIC MINAS			MITSUBISHI MR-J2		
Rated RPM	1000 rpm	2000 rpm	3000 rpm	2000 rpm	3000 rpm	3000 rpm
Maximum RPM	2000 rpm	3000 rpm	5000 rpm	3000 rpm	4000 rpm	4500 rpm
SENTROL2 parameters	NO.1803 3000	NO.1803 3000	NO.1803 3000	NO.1803 3000	NO.1803 3000	NO.1803 3000
	NO.1807 5000 (mV)	NO.1807 3334 (mV)	NO.1807 2000 (mV)	NO.1807 3334 (mV)	NO.1807 2500 (mV)	NO.1807 2223 (mV)
Servo unit parameters	Pr-50 200 (rpm)	Pr-50 300 (rpm)	Pr-50 500 (rpm)	P-25 3000(rpm)	P-25 4000(rpm)	P-25 4500(rpm)

	DAEWOO AC SERVO		
Rated RPM	1000 rpm	1500 rpm	3000 rpm
Maximum RPM	2000 rpm	2500 rpm	4500 rpm
SENTROL2 parameters	NO.1803 3000	NO.1803 3000	NO.1803 3000
	NO.1807 5000 (mV)	NO.1807 4000 (mV)	NO.1807 2223 (mV)
Servo unit parameters	P-28 3750 (x2 mV)	P-28 3000 (x2 mV)	P-28 1667 (x2 mV)

For more details, refer to pages 7-16 and 17 of this manual and the servo unit manual.

5.2 Zero Setting

A) Release of Automatic Drift Compensation Function

Set the maintenance parameters of the SENTROL2 setup screen as follows:

7 bits of NO.1823 ADF

X: 1 → 0
Y: 1 → 0
Z: 1 → 0

NO.1822 DRIFT AMOUNT

X: * → 0
Y: * → 0
Z: * → 0

B) Turn off an on the power of the SENTROL2.

C) Zero Setting of the X-, Y-, and Z-axis Servo

1) Adjust the parameters of the X-axis servo unit so that the position error [pulse] of the general diagnosis No. 0002 X axis of the SENTROL2 diagnosis screen may become "0."

	YASKAWA SIGMA	LG FDA-5000	PANASONIC MINAS	MITSUBISHI MR-J2	DAEWOO AC SERVO
Parameters	CN00 00-03 A-	P3-14	Pr52	P-29	P-09

2) Likewise 1), adjust the parameters of the Y-axis servo unit while observing the No.0002 Y-axis value.

3) Likewise 1), adjust the parameters of the Z-axis servo unit while observing the No.0002 Z-axis value.

D) Activating the Automatic Drift Compensation Function

Set the maintenance parameter of the SENTROL2 setup screen as follows:

7 bits of NO.1823 ADF

X: 0 → 1
Y: 0 → 1
Z: 0 → 1

E) Turn off an on the power of the SENTROL2.

F) Verifying the Zero Setting

Make sure the position error [pulse] of the general diagnosis No. 0002 X-, Y-, and Z-axis of the diagnosis screen is nearly "0," and the drifts of the NO.0010 X-, Y-, and Z-axis falls within the range of "-5 ~ +5."

5.3 Adjustment of Position Loop Gain

A) Release of Automatic Position Loop Gain Compensation

Change the maintenance parameter of the SENTROL2 setup screen as follows:
5 bits of NO.1823 AUG

X: 1 → 0
Y: 1 → 0
Z: 1 → 0

B) Turn off an on the power of the SENTROL2.

C) Position Loop Gain Setting of X-, Y-, and Z-axis Servo

1) Adjust the No. 1807 gain constant of the X-axis servo unit parameters and the SENTROL2 maintenance parameters so that, when moving the X axis up to 2000 to 3000 mm/min. by means of jog or rapid feed, the position loop gain of the general diagnosis No. 0011 X axis of the SENTROL2 diagnosis screen may fall within the range of "2985 ~ 3015."

	YASKAWA SIGMA	LG FDA-5000	PANASONIC MINAS	MITSUBISHI MR-J2	DAEWOO AC SERVO
Parameters	CN04 CN05	P2-03 P2-04	Pr11 Pr12	P-6, P-34, P-35,P-36 P-37,P-38	P-07 P-08

2) Same as 1) for the Y axis.

3) Same as 1) for the Z axis.

D) Activating the Automatic Position Loop Gain Compensation

Set the maintenance parameter of the SENTROL2 setup screen as follows:
5 bits of NO.1823 AUG

X: 0 → 1
Y: 0 → 1
Z: 0 → 1

E) Turn off an on the power of the SENTROL2.

F) Verifying the Adjustment of Position Loop Gain

1) Verify how many times the X axis should be moved to + and - directions at the speed of 2000 ~ 3000 mm/min. by means of rapid feed so that the average of the position loop gains of general NO.0011 X axis displayed on the SENTROL2 diagnosis screen, for both of + and – directions may fall within the range of "2985 ~ 3015."

2) Same as 1) for the Y axis.

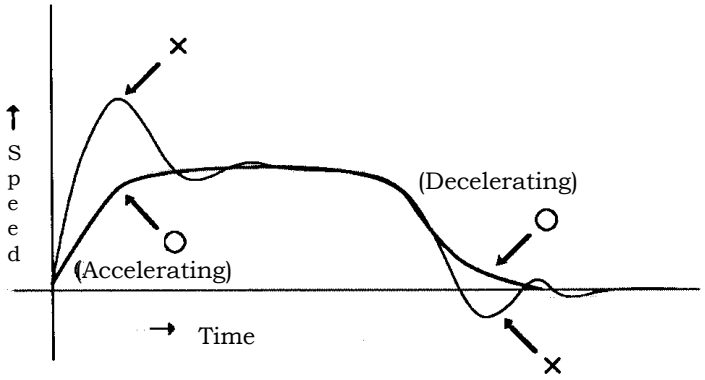
3) Same as 1) for the Z axis.

5.4 Adjustment of Overshoot and Undershoot

Notice) If there are no special problems such as vibration and abnormal noise, it is not necessary to adjust the below items:

A) Adjustment of Loop Gain

1) Make sure that, when moving the X axis at the highest/lowest speed by automatic operation, there is no overshoot or undershoot for the waveform during acceleration or deceleration as shown in the figure below through observing the real speed of the X axis using the servo waveform display function (see page 4-25). Adjust the servo unit parameter if any overshoot or undershoot exists.



	YASKAWA SIGMA	LG FDA-5000	PANASONIC MINAS	MITSUBISHI MR-J2	DAEWOO AC SERVO
Parameters	CN04 CN05 CN1A	P2-03 P2-04	Pr11 Pr12	P-6, P-34 P-35,P-36 P-37,P-38	P-07 P-08
	Auto Tuning CN00 00-05 C-	Auto Tuning P2-22 P2-23 P2-24	Auto Tuning Pr20 Pr21 Pr22	Auto Tuning P-2	

2) Same as 1) for the Y axis.

3) Same as 1) for the Z axis.

5.5 Load Torque Check

A) Load Torque Check

1) When moving the X axis at the speed of 50 mm/min., use the display function of the servo unit to check the load torque. Verify if the load torque becomes 33% or less.

	YASKAWA SIGMA	LG FDA-5000	PANASONIC MINAS	MITSUBISHI MR-J2	DAEWOO AC SERVO
Parameters		St-08 (LoadRate%) St-09 (MaxLoad%)	dP_oL	J (LoadRate%) b (MaxLoad%)	P-32 8 (LoadRate%) P-32 9 (MaxLoad%)

2) Same as 1) for the Y axis.

3) Same as 1) for the Z axis.

B) If the load torque is higher than 50%, it is deemed the load is heavy.

5.6 Display Function of Servo Waveforms

A) Function Overview

Graphically displays the speed waveforms for adjusting the servo.

(Capable of displaying the waveforms such as the instruction value for spindle control, spindle location, and spindle speed)

B) Use Condition

Set the parameter to 2001<SWD>=1.

C) How to Operate

1) Select the servo waveform display screen.

The following menu appears by selecting the diagnosis screen.

Press down the “VELOCITY” menu to show the servo waveform display screen as follows:

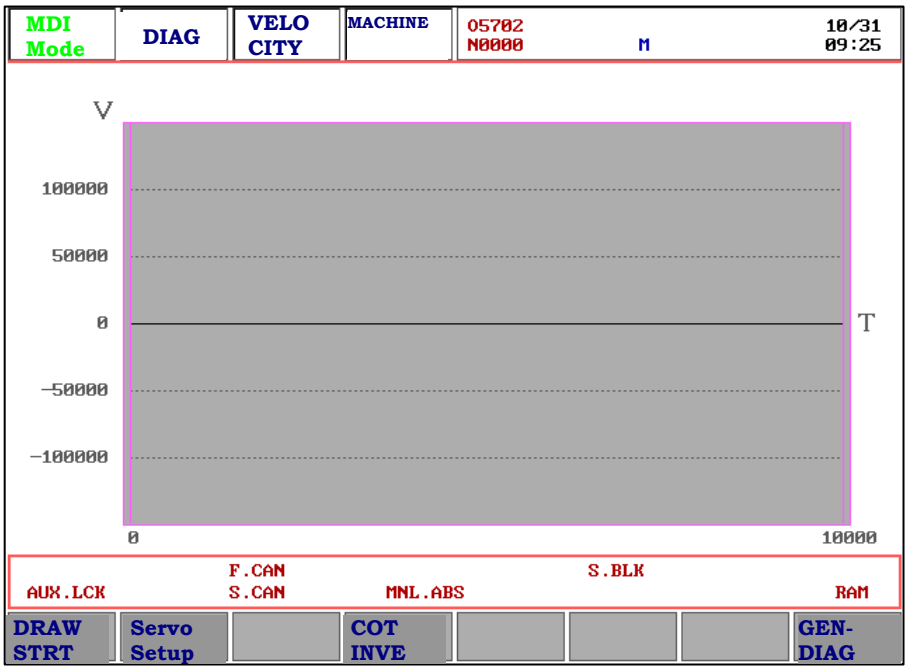


Fig. 5.6-1 Initial screen displaying the servo waveforms

2) Servo Waveform Setup Screen

Press down the “SET GRPH” menu in the servo waveform display screen to show the servo waveform setup screen.

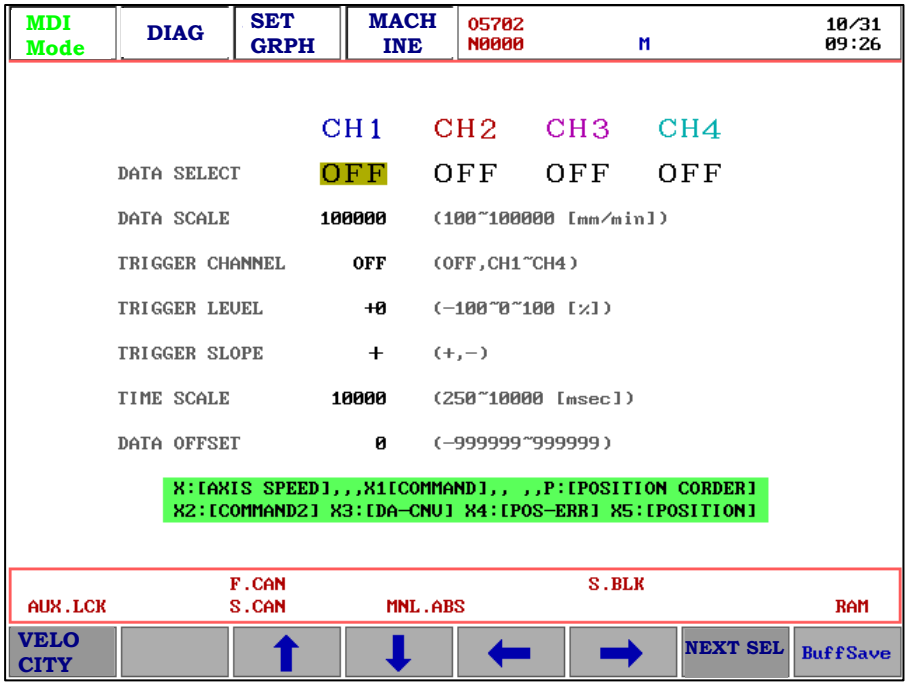


Fig. 5.6-2 Servo waveform setup screen

In this screen, setup any necessary items to display the servo waveforms.

Place the cursor at the corresponding position using the arrow menu and refer to the description below, and then setup the items by pressing “NEXT SEL” or entering appropriate values.
(DATA SELECT / DATA SCALE / TRIGGER CHANNELL / TRIGGER LEVEL / TRIGGER SLOPE / TIME SCALE / DATA OFFSET)

After confirming the setup configuration, go back to the servo waveform display screen by pressing the “VELOCITY.”

*) Save function for servo data (manual operation mode excluded.)

1. Press the “BuffSave” to display ‘INPUT FILE NO.’
2. Enter the program number that is empty within the range of 1~9999.
3. The servo data lastly buffered as Oxxxx is saved.

A) DATA SELECT

It is possible to display the screens up to 4 channels simultaneously, and select each item for each channel.

X: [AXIS SPEED] Actual speed of the spindle
X1: [COMMAND1] Instruction value before acceleration/deceleration
X2: [COMMAND2] Instruction value after acceleration/deceleration
X3: [DA-CNV] Value of DA-CONVERTER
X4: [POS ERR] Value of POSITION ERROR
X5: [POSITION] Spindle location
P: [POSITION CORDER] Spindle speed

B) DATA SCALE

Speed range of waveform display – applicable to display the speed (X, X1, X2) (mm/min)
Select out of [100 200 500 1000 2000 5000 10000 20000 50000 100000].

C) TRIGGER CHANNELL

Select the targeted channel for trigger or select OFF.
*) The targets for trigger are X [AXIS SPEED] and X5 [POSITION].

D) TRIGGER LEVEL

When selecting axis speed: Select out of [0 +25 +50 +75 100 -100 -75 -50 -25 (%)], based on the selected value from the data scale.
When selecting position: Enter the corresponding number for the trigger position.

E) TRIGGER SLOPE

Select either [+] or [-] according to the triggering direction. "+" means being accelerated, while "-" being decelerated.

*) Example of trigger (in the case of selecting the axis speed trigger channel)
For DATA SCALE=1000, TRIGGER LEVEL=+50, and TRIGGER SLOPE="+," start the measurement from the point of time when the data falls between 499 and 500. (It is possible to display the waveform 2 to 3 seconds prior to the measurement commencement.)

F) TIME SCALE

Select out of the time intervals of data display, [250 500 1000 2000 5000 10000 (msec)].

G) DATA OFFSET

Compensate this value for the value set at the data scale and display the waveform by entering an appropriate number.

3) Servo Waveform Display Screen

When pressing the “DRAW STRT”/“CONTINUE” and the buffering is completed (approx. 10 seconds), the waveform is displayed.

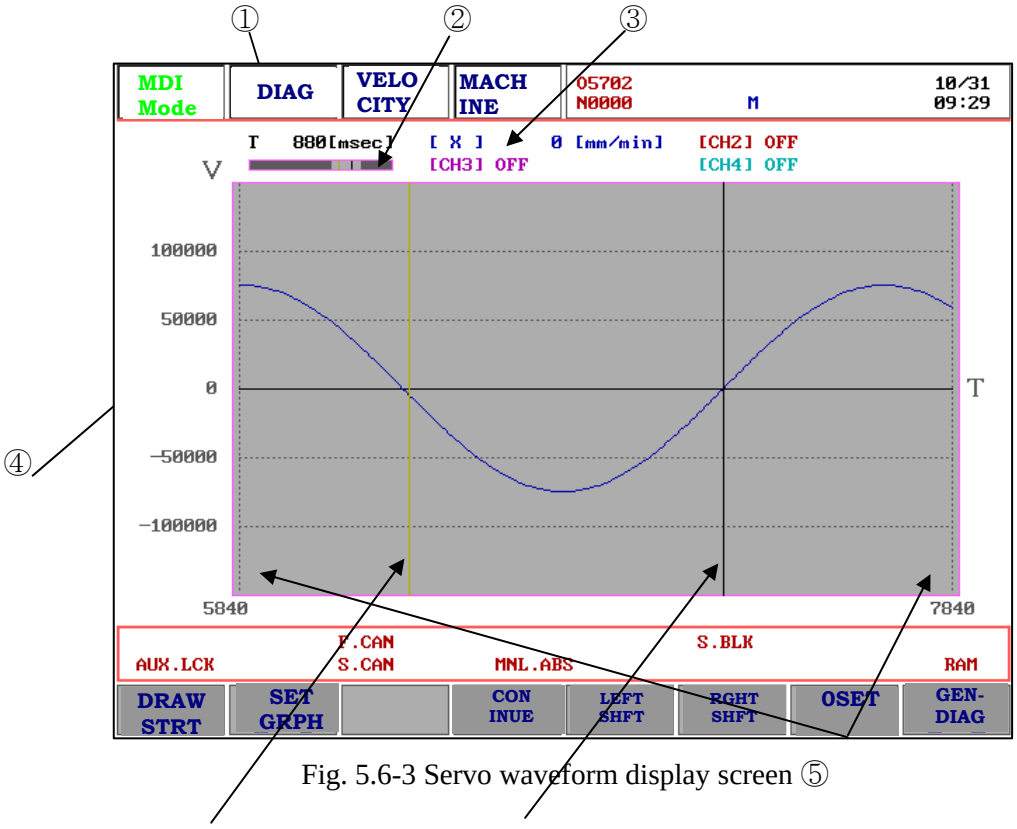


Fig. 5.6-3 Servo waveform display screen ⑤

Zero position (zero setting) Location of the current cursor

① Display the relative time to make the zero position (the basic is time to start measurement) “0.”

② Show the data and cursor positions that are currently displayed for the entire data.

③ Show the selected items, data values, and data unit for each channel.

④ Show the set speed range. (DATA SCALE + DATA OFFSET)

⑤ Show the current display time. (TIME SCALE)

“DRAW STRT”: Display the waveform after buffering. (Repressing the menu during measurement will stop the operation.)

“SET GRPH”: Go to the servo waveform setup screen.

“CONTINUE”: Continuously display the waveform after buffering. (Repressing the menu during continuous display will stop the operation.)

“LEFT SHFT”: Move the cursor position to the left.

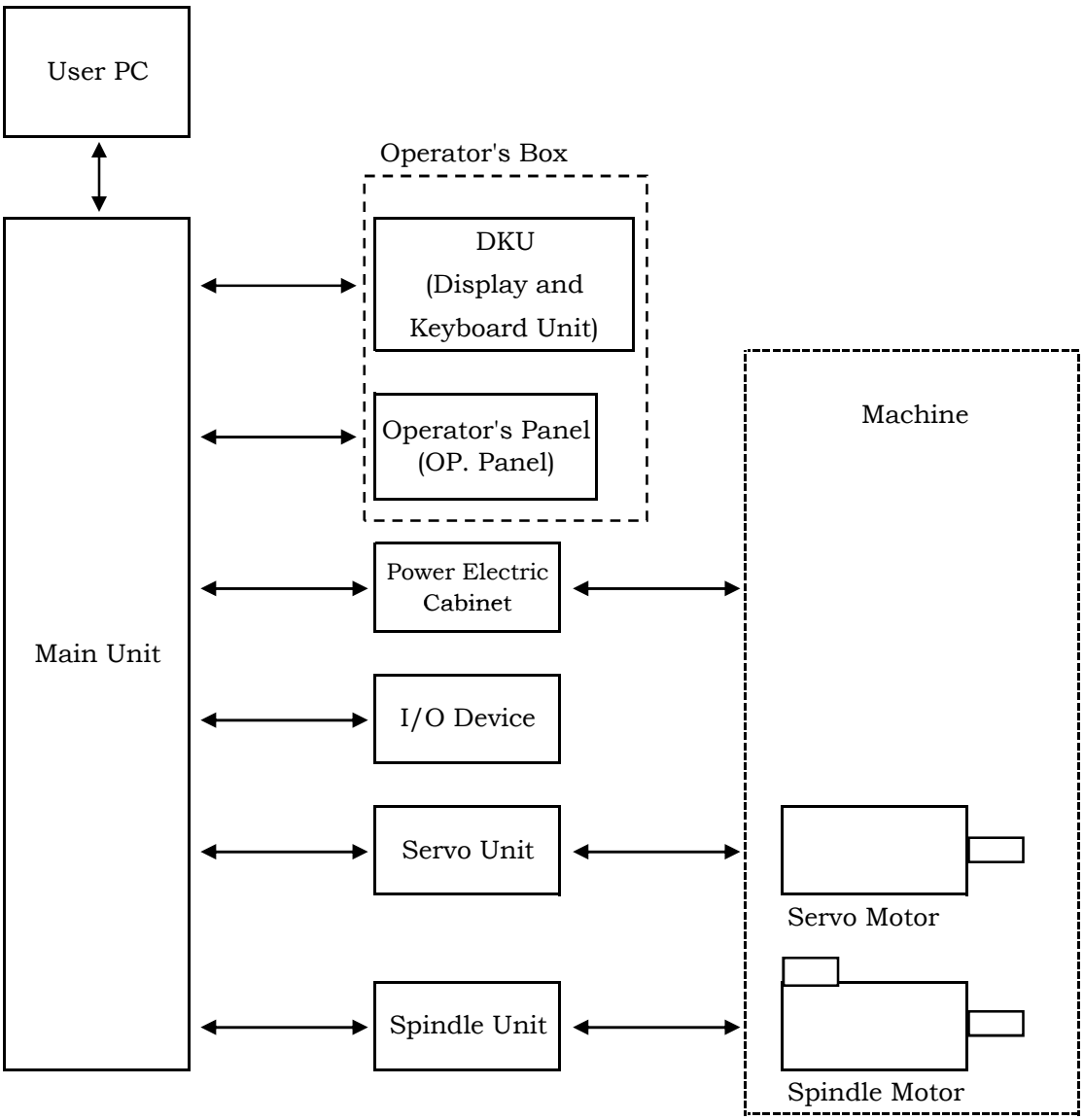
“RGHT SHFT”: Move the cursor position to the right.

“0 SET”: Set the current cursor position to “0.”

“GEN-DIAG”: Go to the general diagnosis menu.

Chapter 5 Hardware of SENTROL2

1. System Configuration

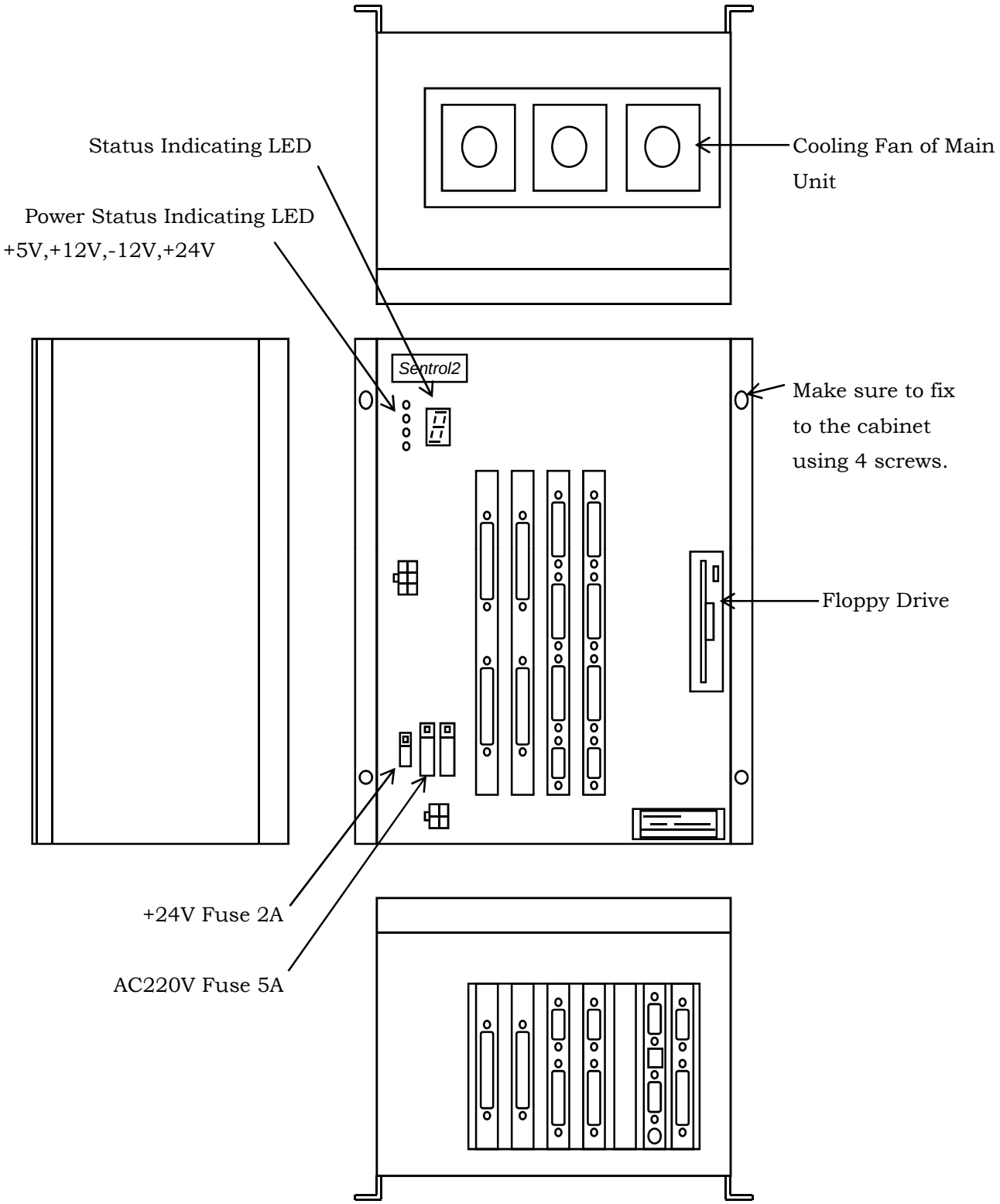


Operator's Panel = OP. Panel

Power Electric Cabinet = Cabinet

I/O Device = FDD unit (floppy disk drive, etc.)

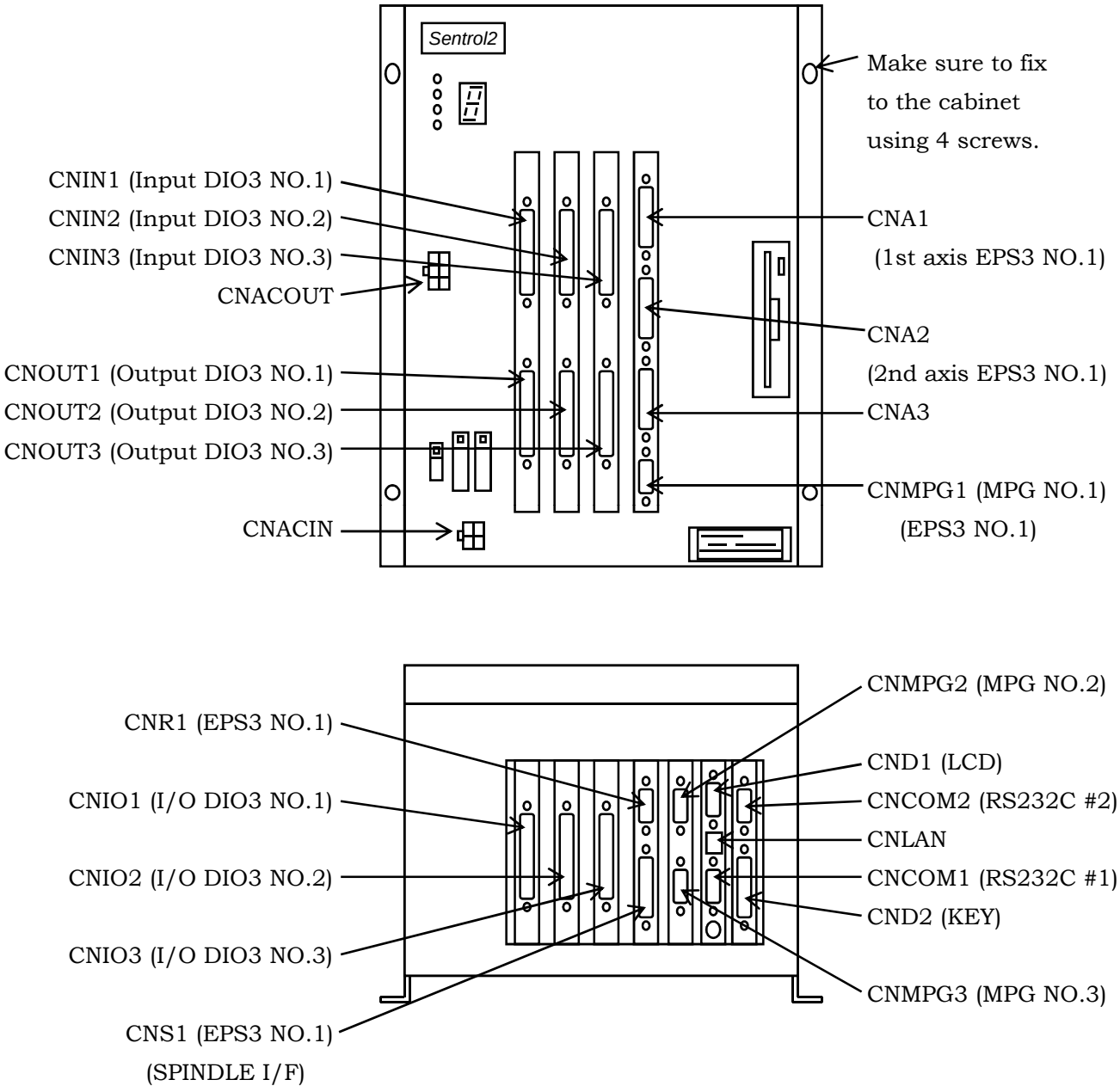
2. Configuration of Main Unit



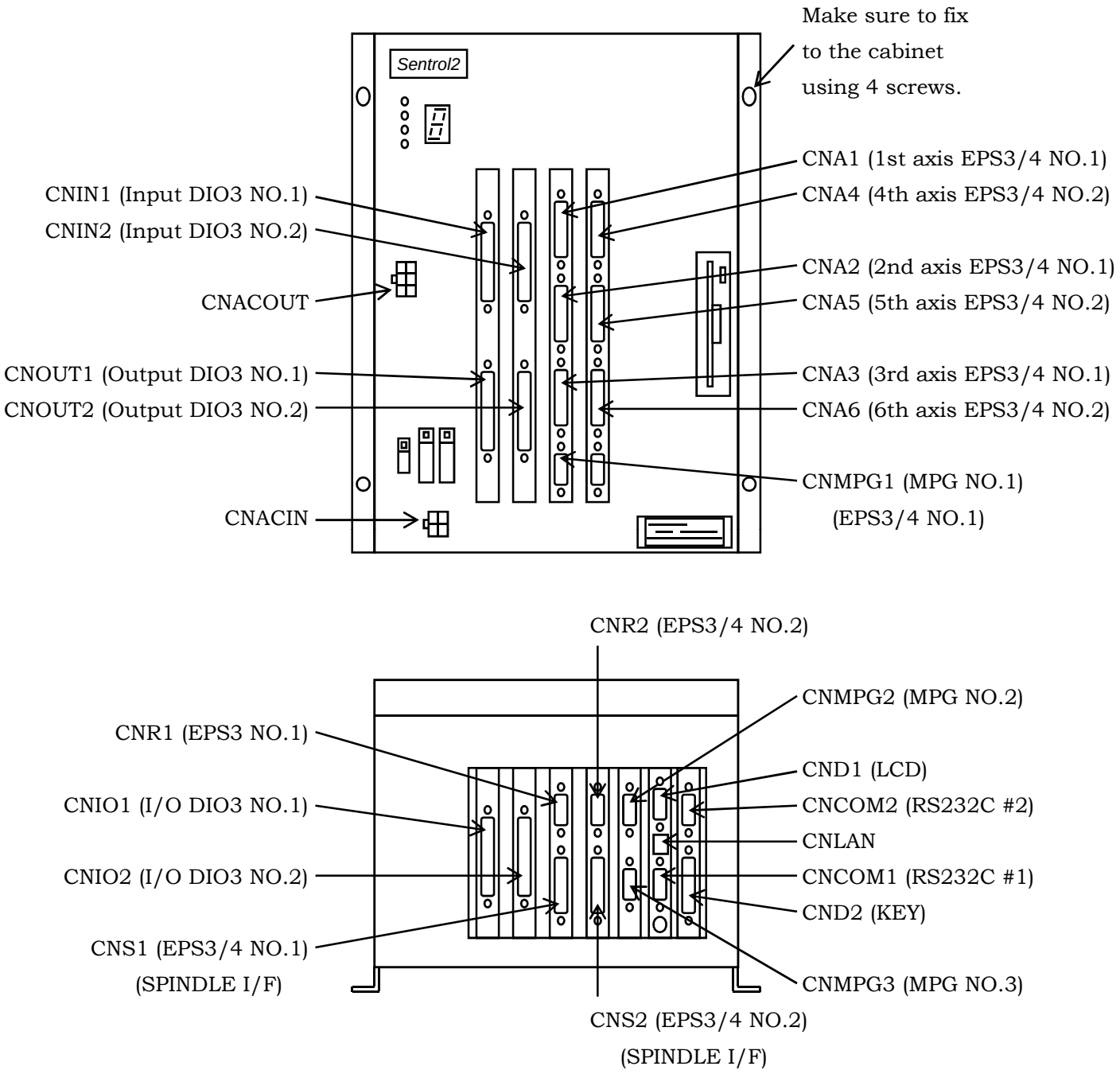
3. Connector Layouts

3.1 Connectors of Main Unit

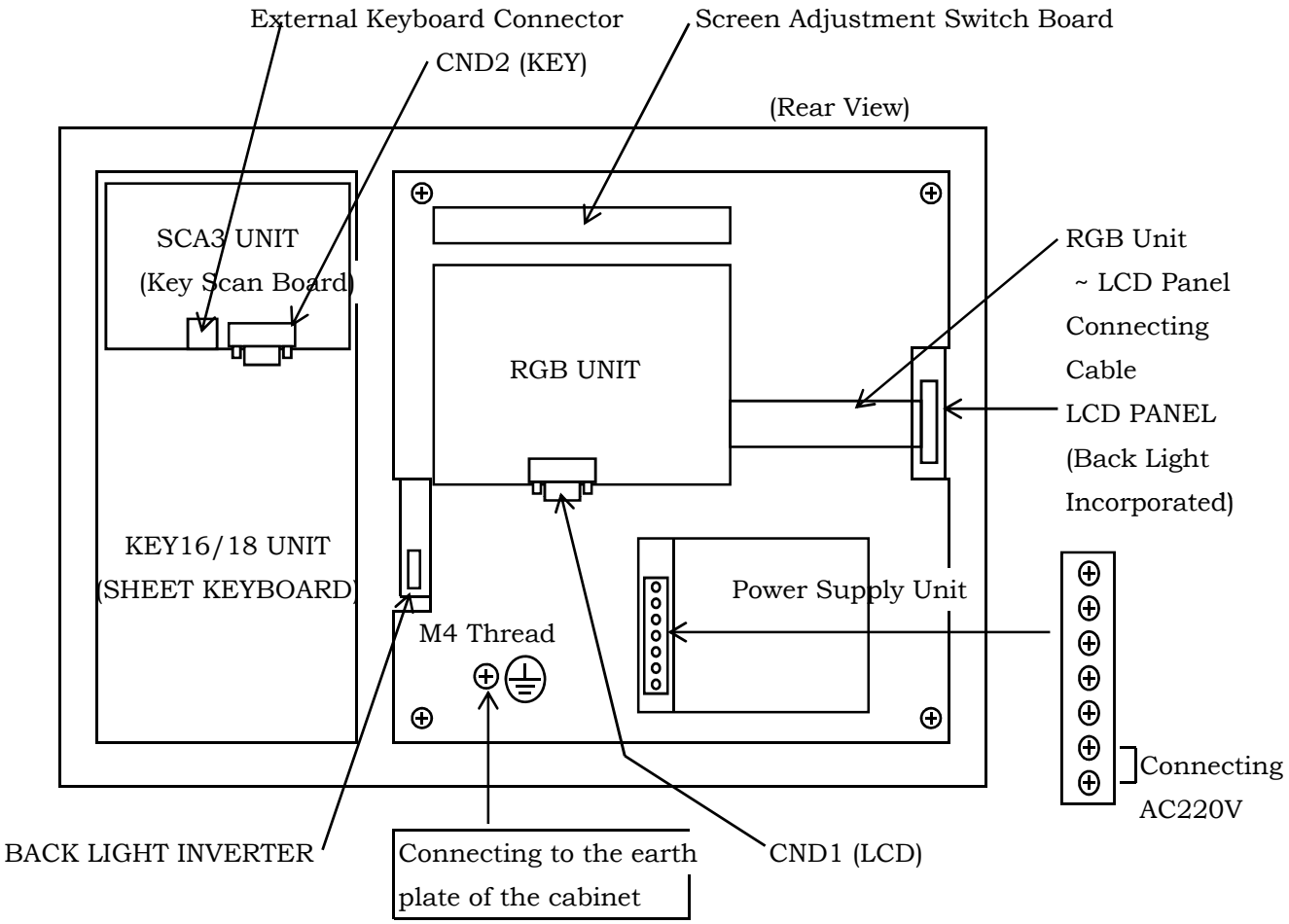
1) 4-axis (spindle included) specification



2) 8-axis (spindle included) specification



3.2 Connectors of DKU (Display Keyboard Unit)

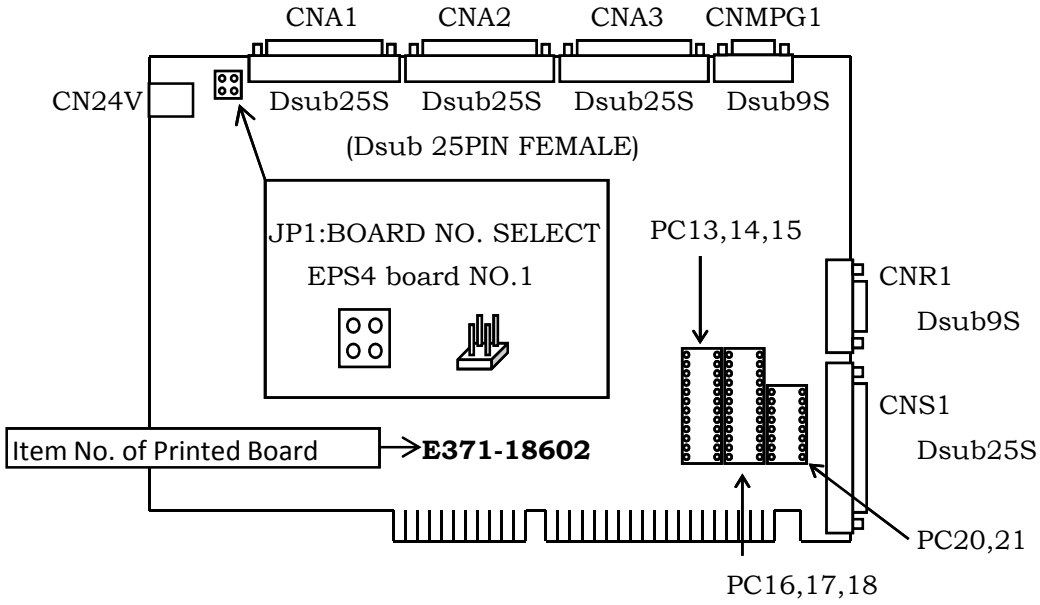


Connectors	Connectors of DKU Side
CND1	Dsub Connector 15 Pin Female
CND2	Dsub Connector 9 Pin Female

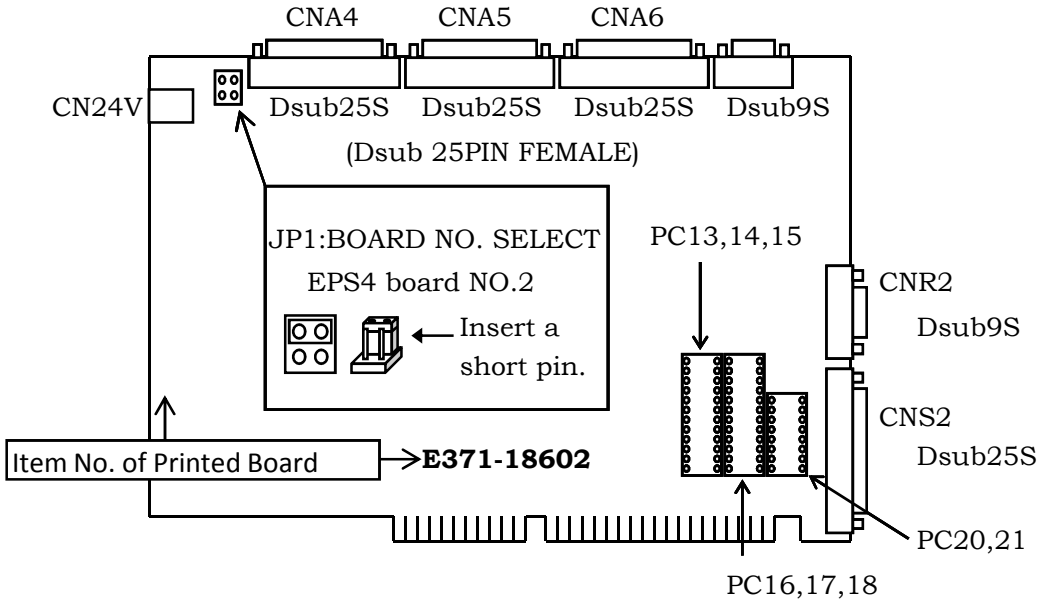
3.3 Connectors of EPS4 Board

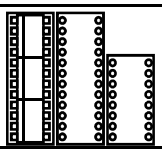
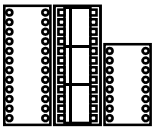
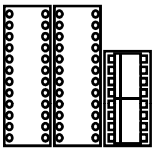
1) In case that the item No. of the printed board is after **E371-18602**

A) EPS4 board NO.1

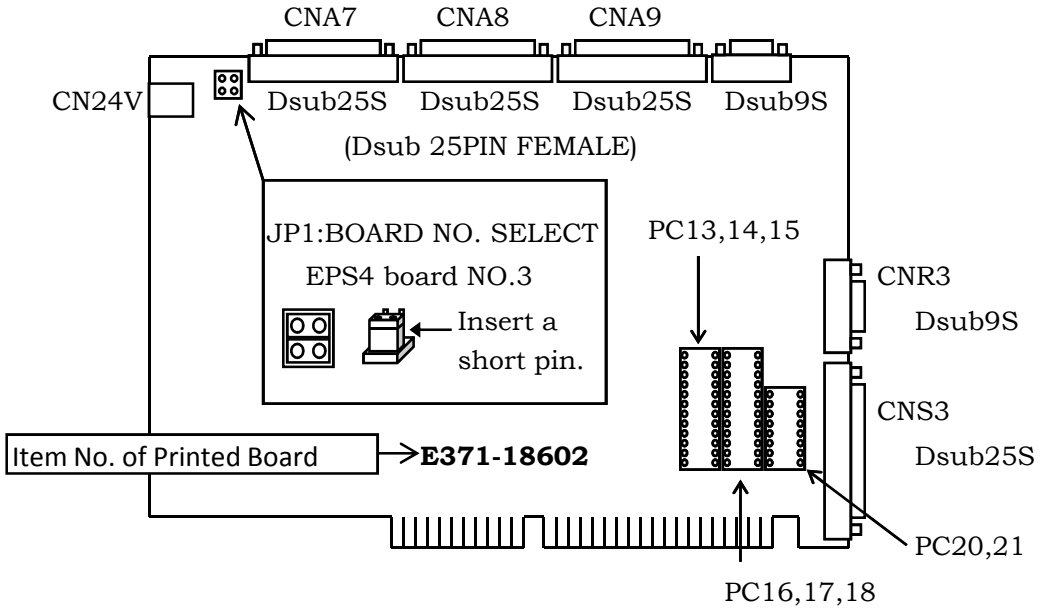


B) EPS4 board NO.2

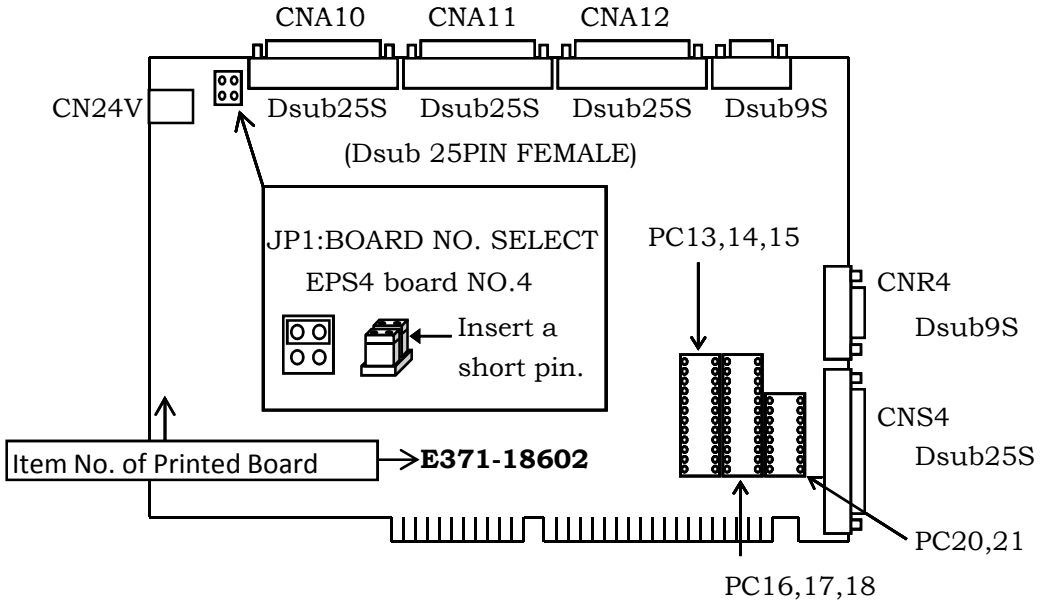


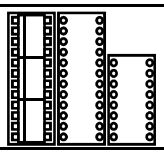
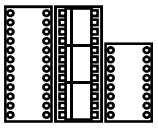
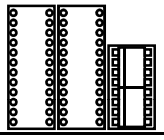
The output of spindle DO is Emitter Common.	Insert photo coupler into the PC13, 14, and 15		FUJI 5000M3 FUJI 5000MS5
The output of spindle DO is Collector Common.	Insert photo coupler into the PC16, 17, and 18.		MITSUBISHI SG-J,SF, MDS-A-SPA,SPJA YASKAWA VS626VM3
Use CNS1 as the interface of the servo spindle.	Insert photo coupler into the PC20 and 21.		

C) EPS4 board NO.3



D) EPS3 board NO.4

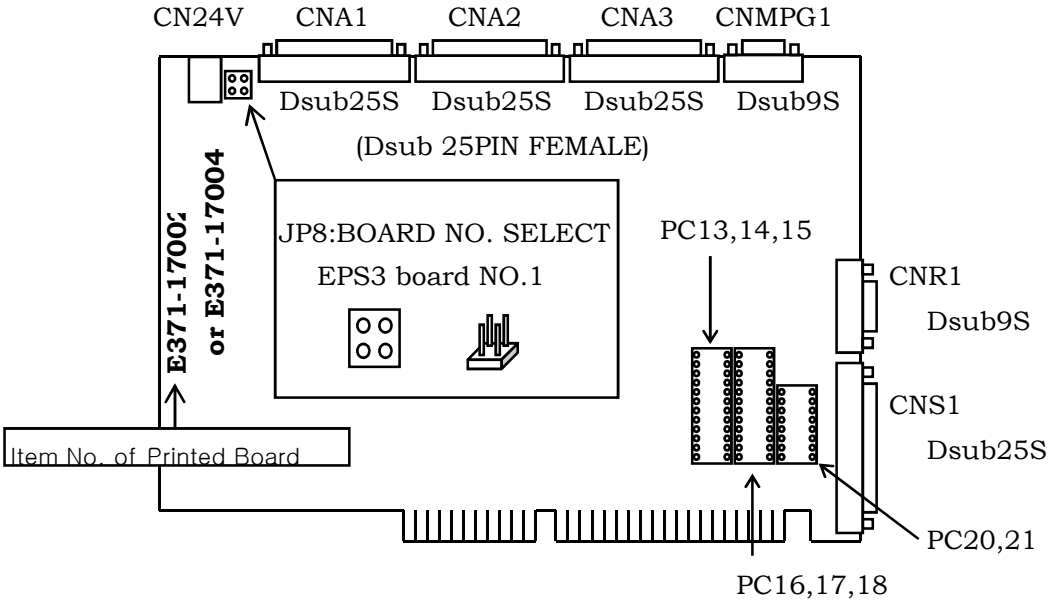


The output of spindle DO is Emitter Common.	Insert photo coupler into the PC13, 14, and 15.		FUJI 5000M3 FUJI 5000MS5
The output of spindle DO is Collector Common.	Insert photo coupler into the PC16, 17, and 18.		MITSUBISHI SG-J,SF, MDS-A-SPA,SPJA YASKAWA VS626VM3
Use CNS1 as the interface of the servo spindle.	Insert photo coupler into the PC20 and 21.		

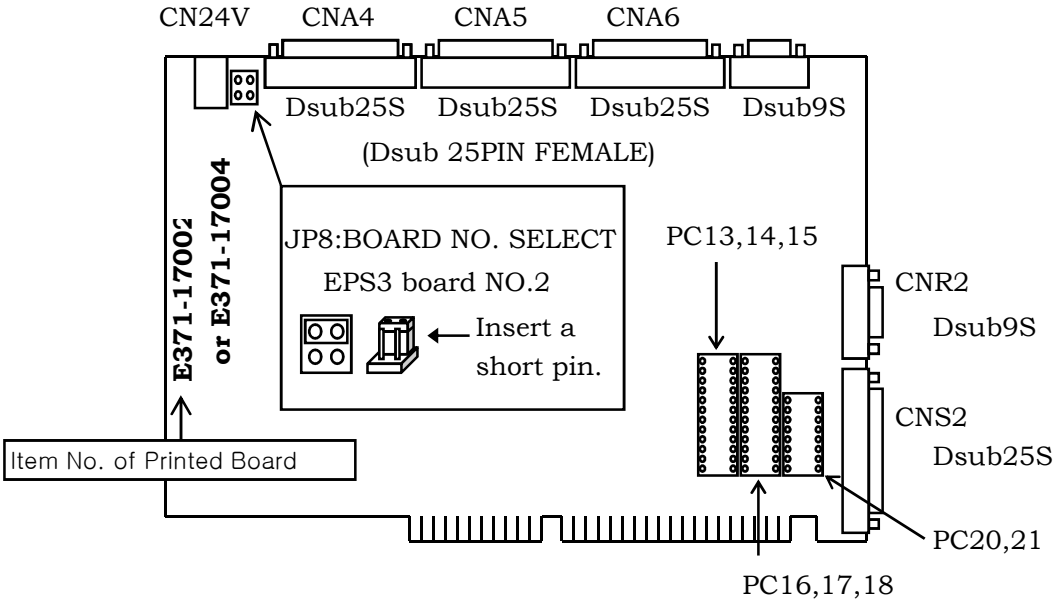
3.4 Connectors of EPS3 Board

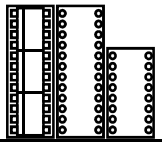
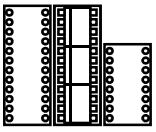
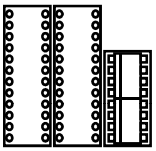
1) In case that the item No. of the printed board is **E371-17002 or E371-17004** (new version)

A) EPS3 board NO.1

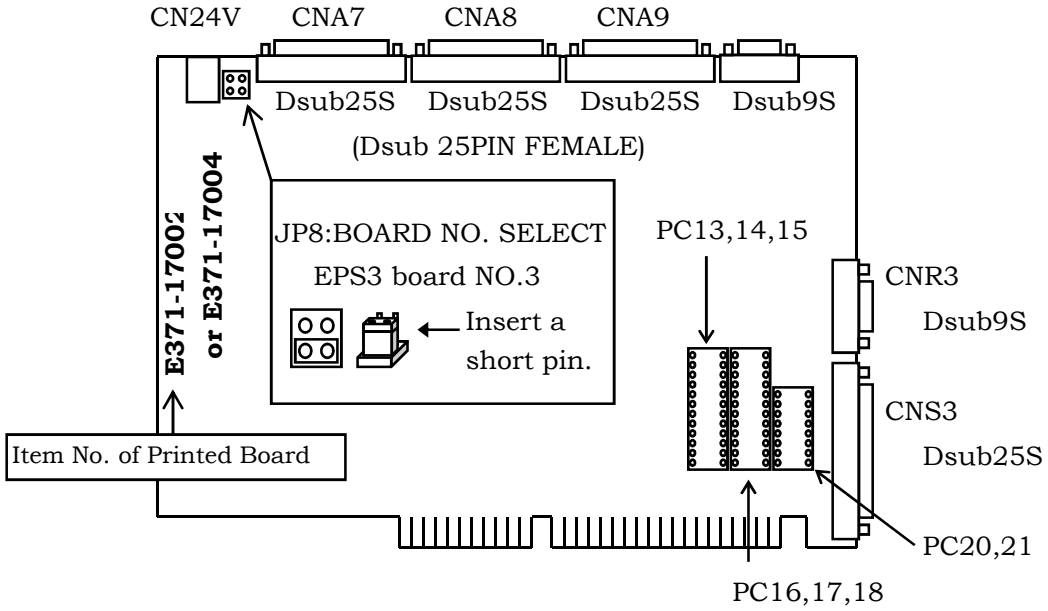


B) EPS3 board NO.2

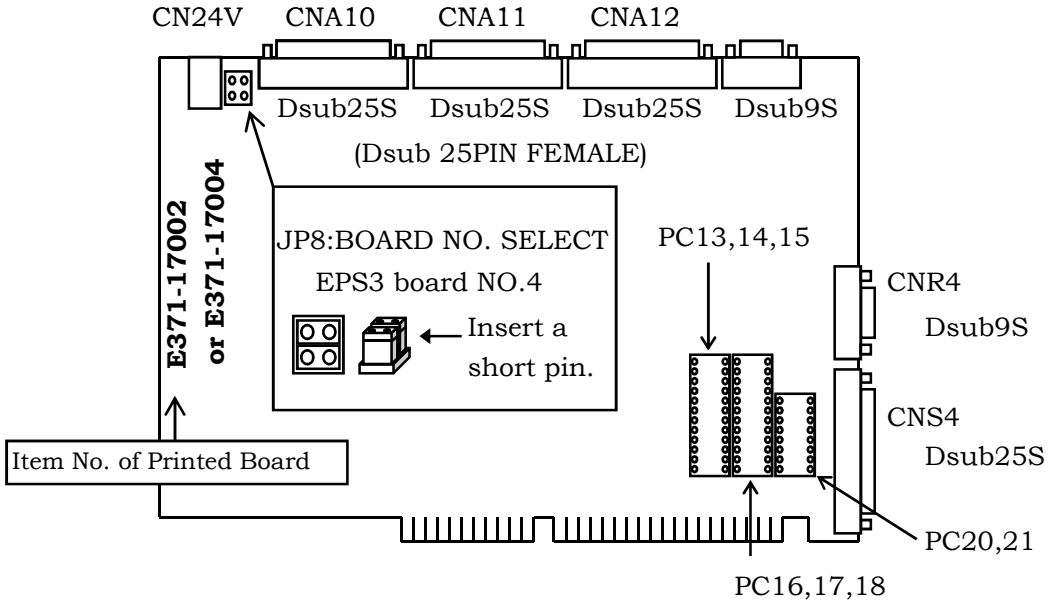


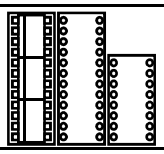
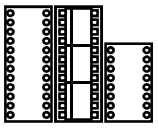
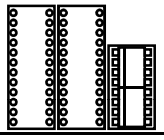
The output of spindle DO is Emitter Common.	Insert photo coupler into the PC13, 14, and 15		FUJI 5000M3 FUJI 5000MS5
The output of spindle DO is Collector Common.	Insert photo coupler into the PC16, 17, and 18.		MITSUBISHI SG-J,SF, MDS-A-SPA,SPJA YASKAWA VS626VM3
Use CNS1 as the interface of the servo spindle.	Insert photo coupler into the PC20 and 21.		

C) EPS3 board NO.3



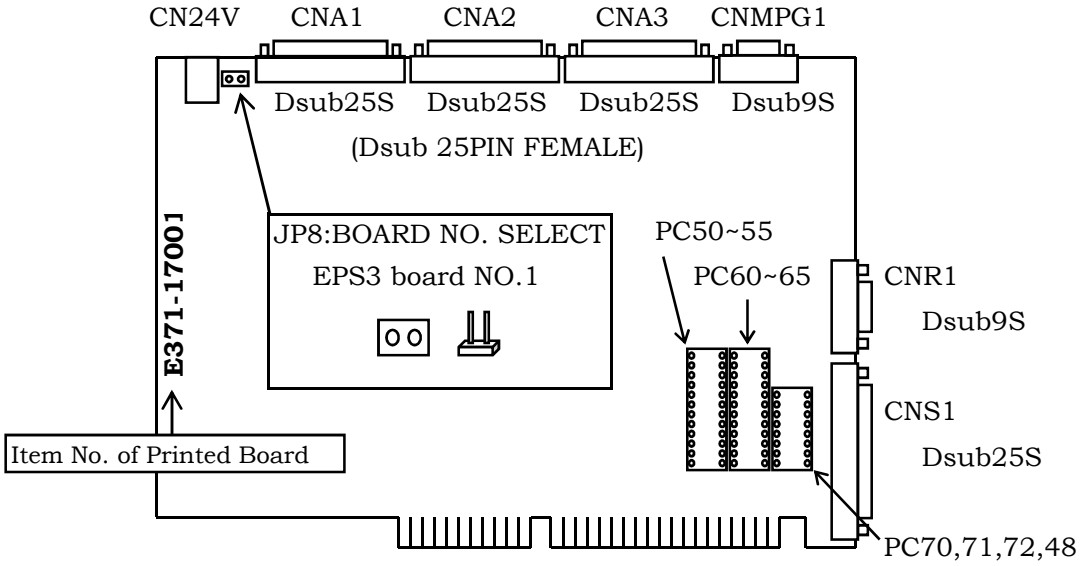
D) EPS3 board NO.4



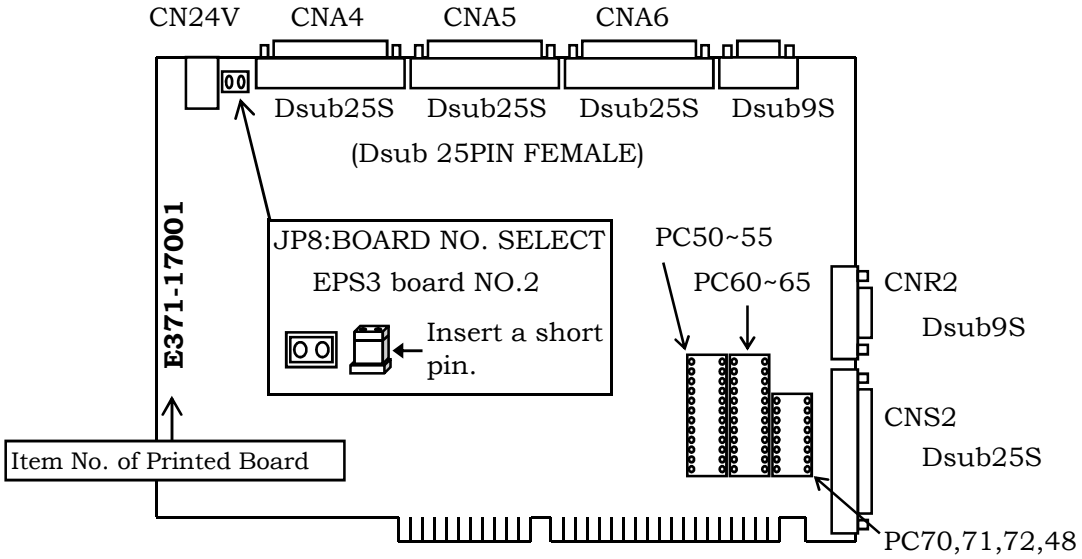
The output of spindle DO is Emitter Common.	Insert photo coupler into the PC13, 14, and 15.		FUJI 5000M3 FUJI 5000MS5
The output of spindle DO is Collector Common.	Insert photo coupler into the PC16, 17, and 18.		MITSUBISHI SG-J,SF, MDS-A-SPA,SPJA YASKAWA VS626VM3
Use CNS1 as the interface of the servo spindle.	Insert photo coupler into the PC20 and 21.		

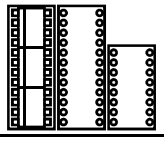
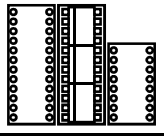
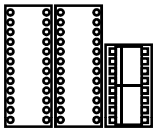
2) In case that the item No. of the printed board is E371-17001 (old version)

A) EPS3 board NO.1



B) EPS3 board NO.2

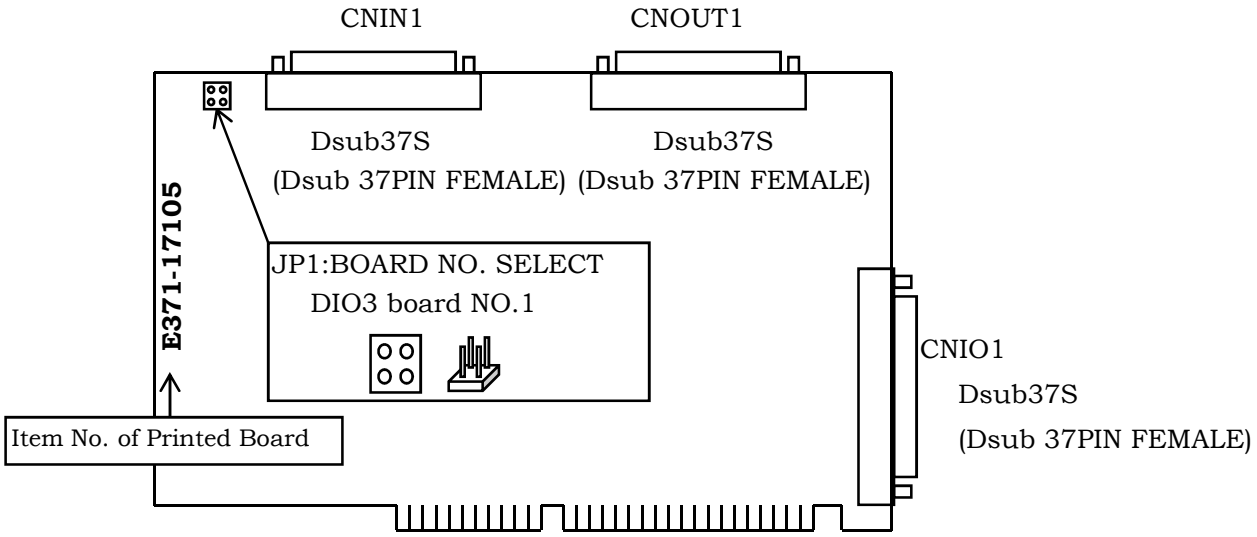


The output of spindle DO is Emitter Common.	Insert photo coupler into the PC50 ~ 55.		FUJI 5000M3 FUJI 5000MS5
The output of spindle DO is Collector Common.	Insert photo coupler into the PC60~65.		MITSUBISHI SG-J,SF, MDS-A-SPA,SPJA YASKAWA VS626VM3
Use CNS1 as the interface of the servo spindle.	Insert photo coupler into the PC70, 71, 72, and 48.		

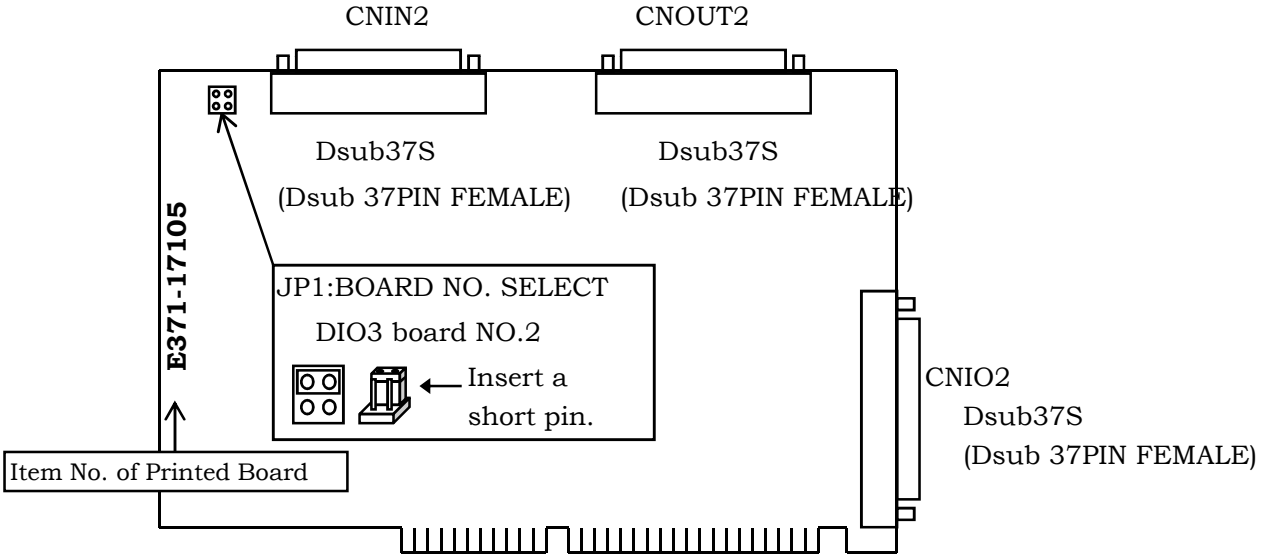
3.5 Connectors of DIO3 Board

1) In case that the item No. of the printed board is after **E371-17105**

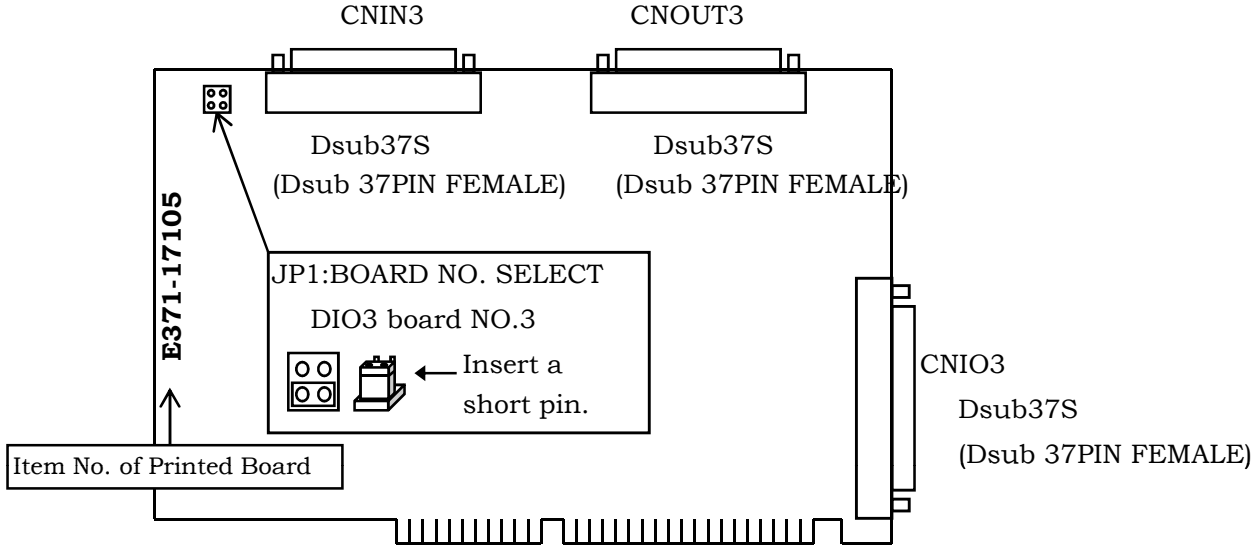
A) DIO3 board NO.1



B) DIO3 board NO.2

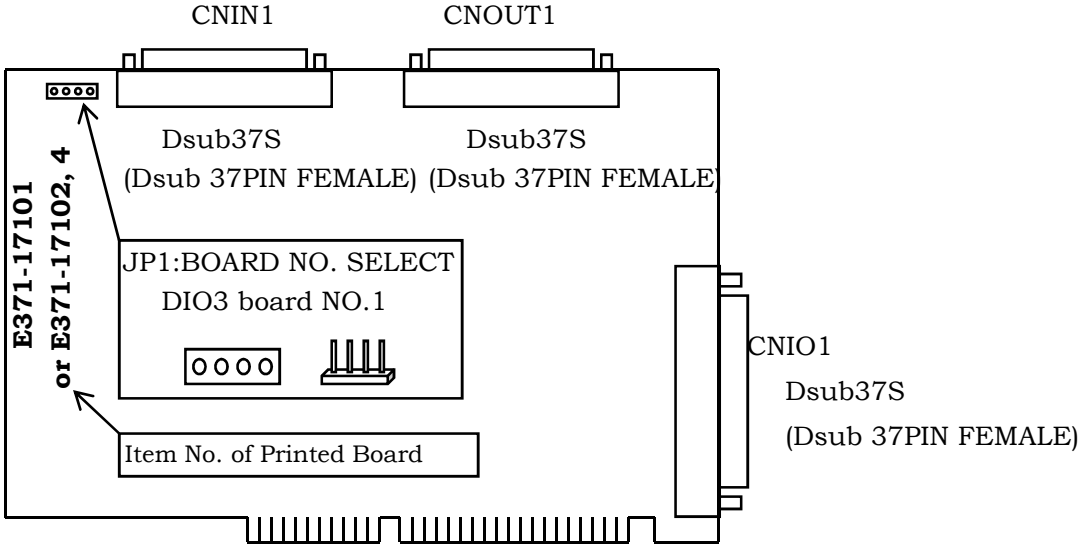


C) DIO3 board NO.3

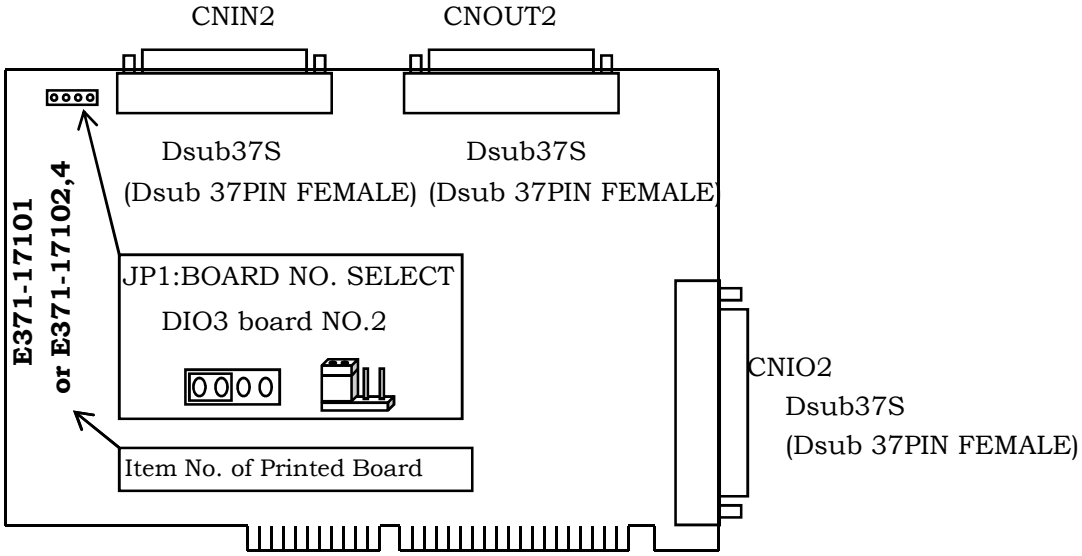


2) In case that the item No. of the printed board is
E371-17101, **E371-17102, and E371-17104**

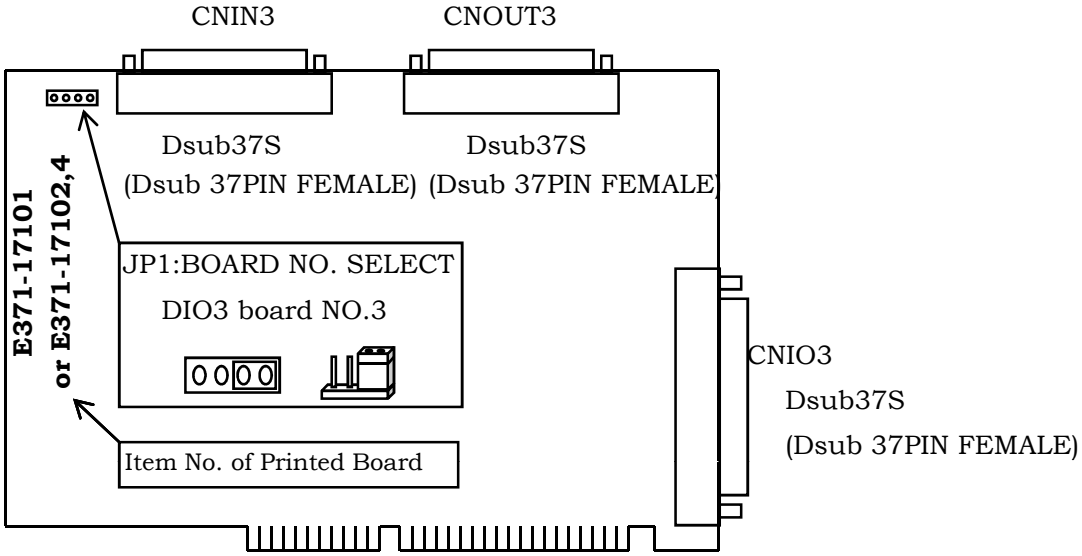
A) DIO3 board NO.1



B) DIO3 board NO.2

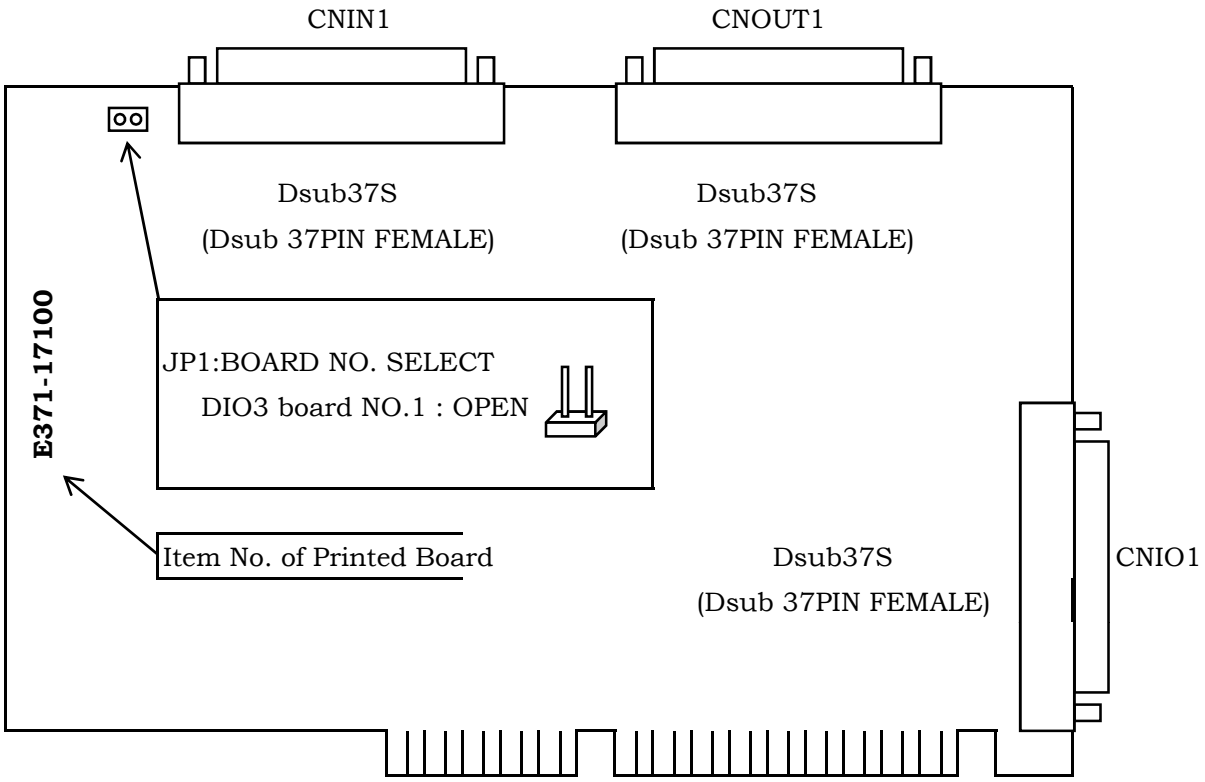


C) DIO3 board NO.3

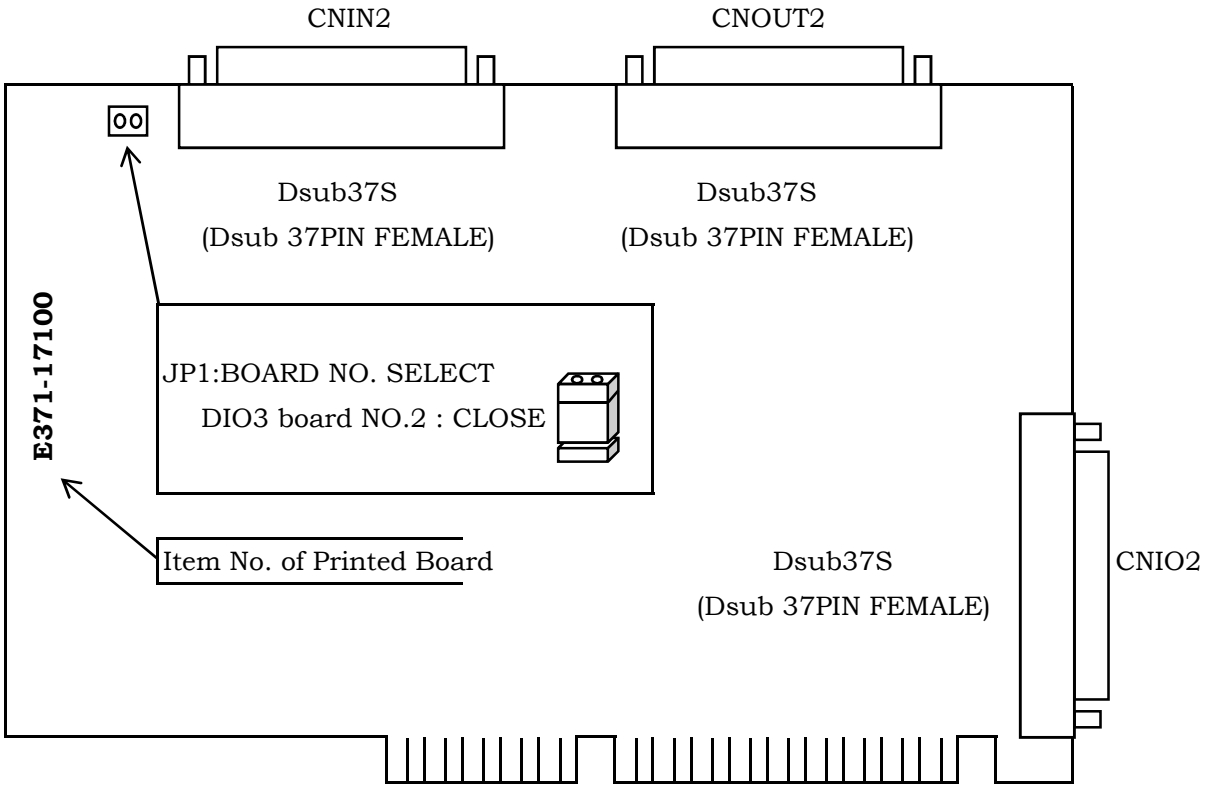


3) In case that the item No. of the printed board is **E371-17100**

A) DIO3 board NO.1



B) DIO3 board NO.2



4. Installation

4.1 Enviromental Requirements for Installation

1) Ambient Temperature
   Operation: 0℃ ~ 45℃
   Storage: -20℃ ~ 60℃
2) Humidity: 75% or less
3) Vibration: 0.5G or less during operation
4) Power supply: AC220V ±10% , 50/60Hz ±1Hz

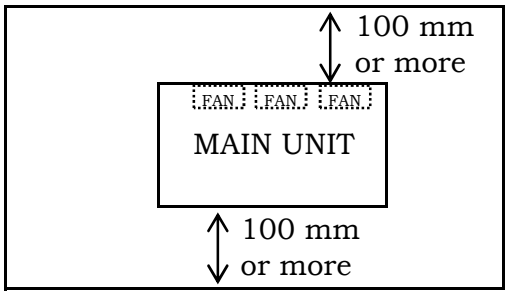
4.2 Power Supply Capacity

Capacity of 0.4KVA + Servo Unit

Refer to the specification of each servo motor because the capacity of the servo unit depends on the motor type.

4.3 Design Requirements for Cabinet

1) Completely enclosed structure
2) Designed to have the internal temperature rise of the cabinet 10℃ or less, compared with the external temperature.
3) Designed to make air flow at the degree of 0.5m/sec through the surface of each unit using a fan.
   However, be sure not to have each unit face the air flow directly.
4) As a noise countermeasure, make sure to mount each unit with a gap more than 100 mm at the cable of DC50V or higher, or AC power supply.
5) There should exist at least 100 mm of space at the top and bottom of the main unit.



4.4 Heating Value of Each Unit

UNIT	Heating Value
MAIN UNIT	150W
DKU (for SENTROL2)	30W
DKU (for PNC2)	125W

4.5 About Use of Indirect Cooler

An indirect cooler efficiently discharges the internal heat to the outside while completely blocking the outside and the inside of the cabinet, even under the the worst environmental conditions including dusts, oils, and moisture, further enhancing the controller's stable operation and reliability. Therefore, it is highly recommended to use an indirect cooler.

4.6 Dust Protection Countermeasure

There is a high possibility for insulation deterioration in the main unit or the DKU (Display Keyboard Unit) due to dusty environment, thus make sure to block the cabinet door and the cable inlet using a packing.

4.7 Noise Countermeasure

1) Separation of Signal Cables

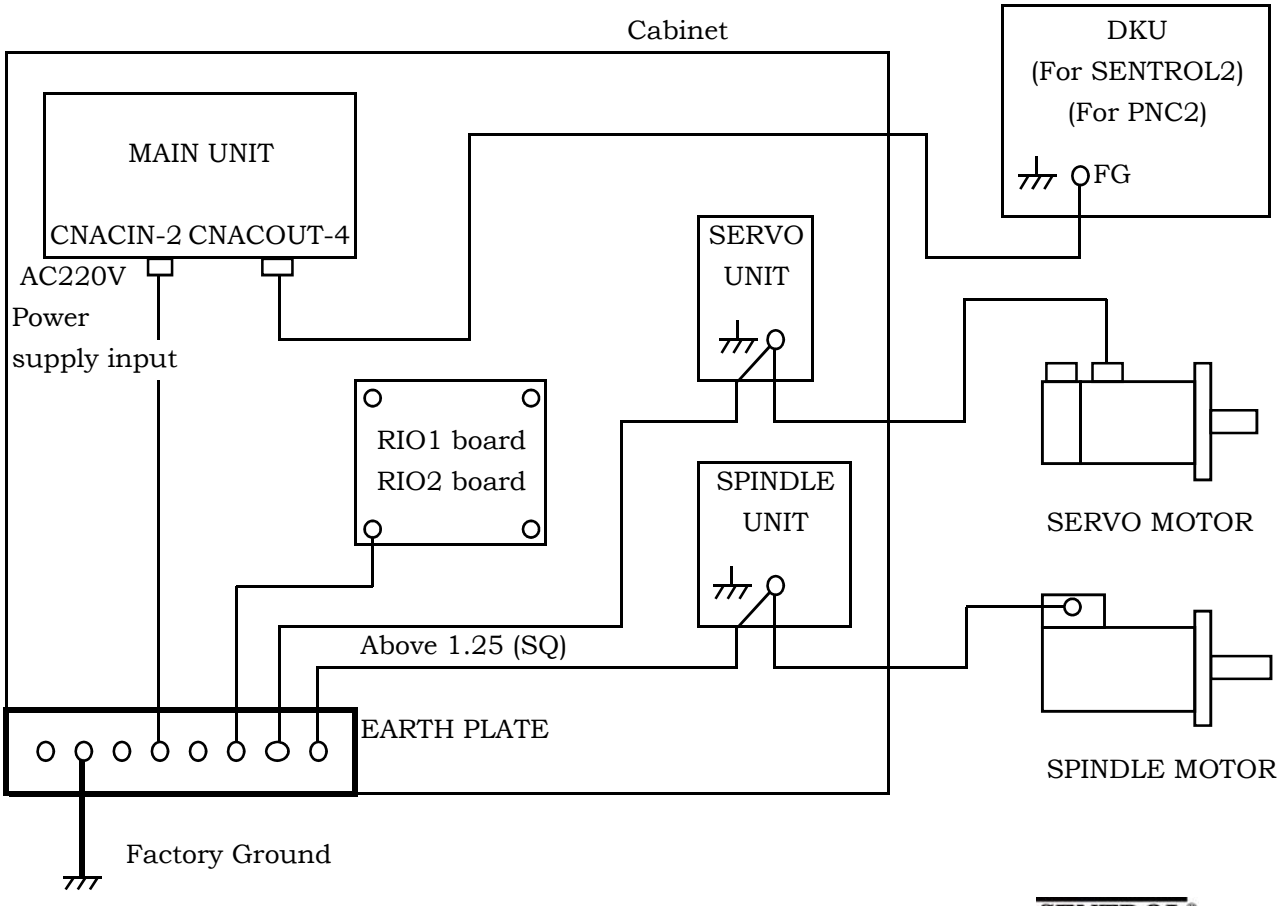
The mechanical wiring is grouped shown as the table below.

The Group A shall be separated from the Group B and C by 100 mm or more.

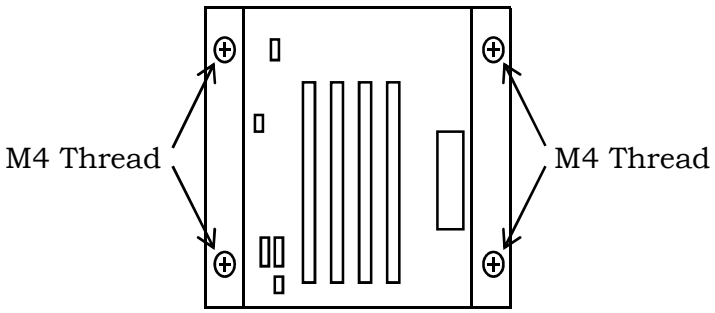
GROUP	Wirings	Measures
A	AC line at the primary side AC line at the secondary side Power cable Power cable of AC, DC motor, and servo/spindle motor AC solenoid AC relay	Make sure to separate from the Group B and C by 100 mm or more. Attach a spark killer or a diode to the solenoid and relay.
B	DC solenoid (24V) DC relay (24V) Main unit ~ switch, lamp, and relay RIO1/RIO2 board ~ switch and LEDs Main unit ~ 24V AVR RIO1/RIO2 board ~ 24V AVR	Make sure to separate from the Group A by 100 mm or more. Attach a spark killer or a diode to the solenoid and relay. Make sure to separate from the Group A by 100 mm or more. It is recommended to use a shielded cable.
C	Main unit ~ servo unit Main unit ~ MPG Main unit ~ DKU Main unit ~ RS232C Main unit ~ RIO1/RIO2 board	Make sure to separate from the Group A by 100 mm or more. Use a shielded cable and connect the shield of the shielded cable to the ground.

2) Ground

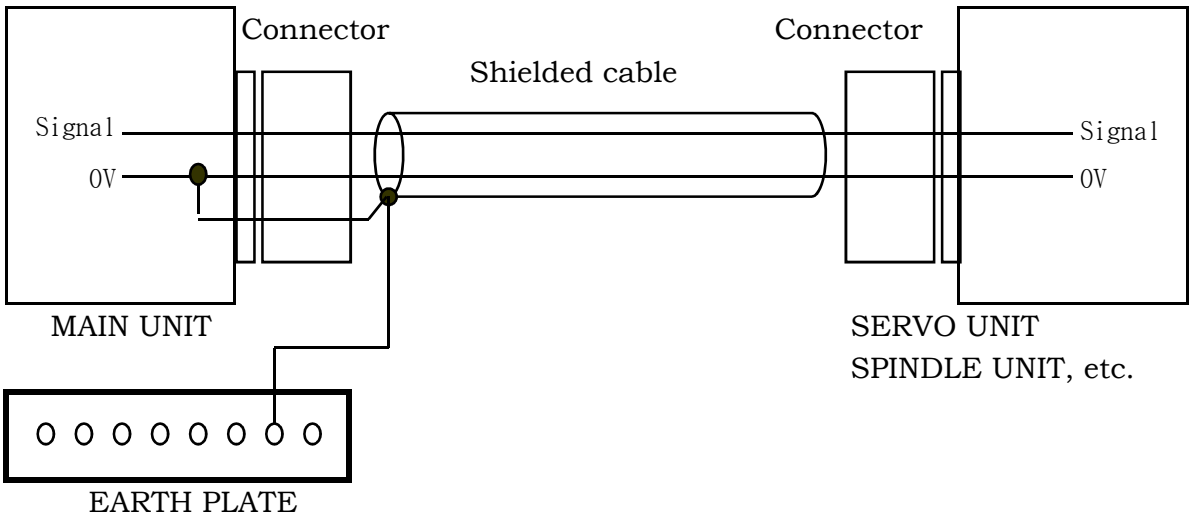
A) Unit Ground



B) Make sure to fix the main unit to the cabinet.



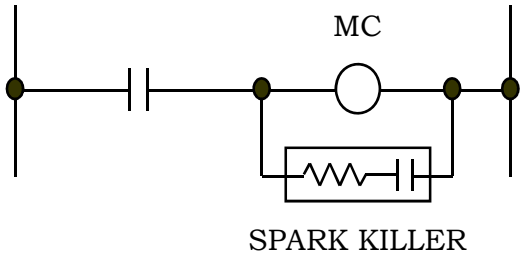
C) Shielding a shielded cable



3) Spark Killer/Diode

As noise countermeasure, be sure to connect spark killers / diodes to the both ends of the coils of relay, MC (Magnetic Contactor), solenoid, etc.
Connect a spark killer for AC, while a diode for DC.

A) Spark Killer

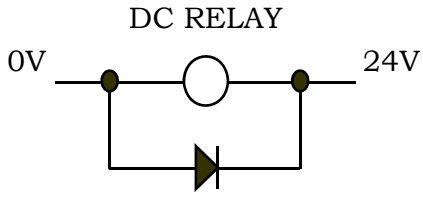


Resistance (R): Corresponds to the DC resistance of the coil.
CAPACITANCE(C) :

$$\frac{I^2}{10} \sim \frac{I^2}{20} (\mu F)$$

I: Ampere (A) for a normal coil

B) Diode



DIODE 1A, 2000V

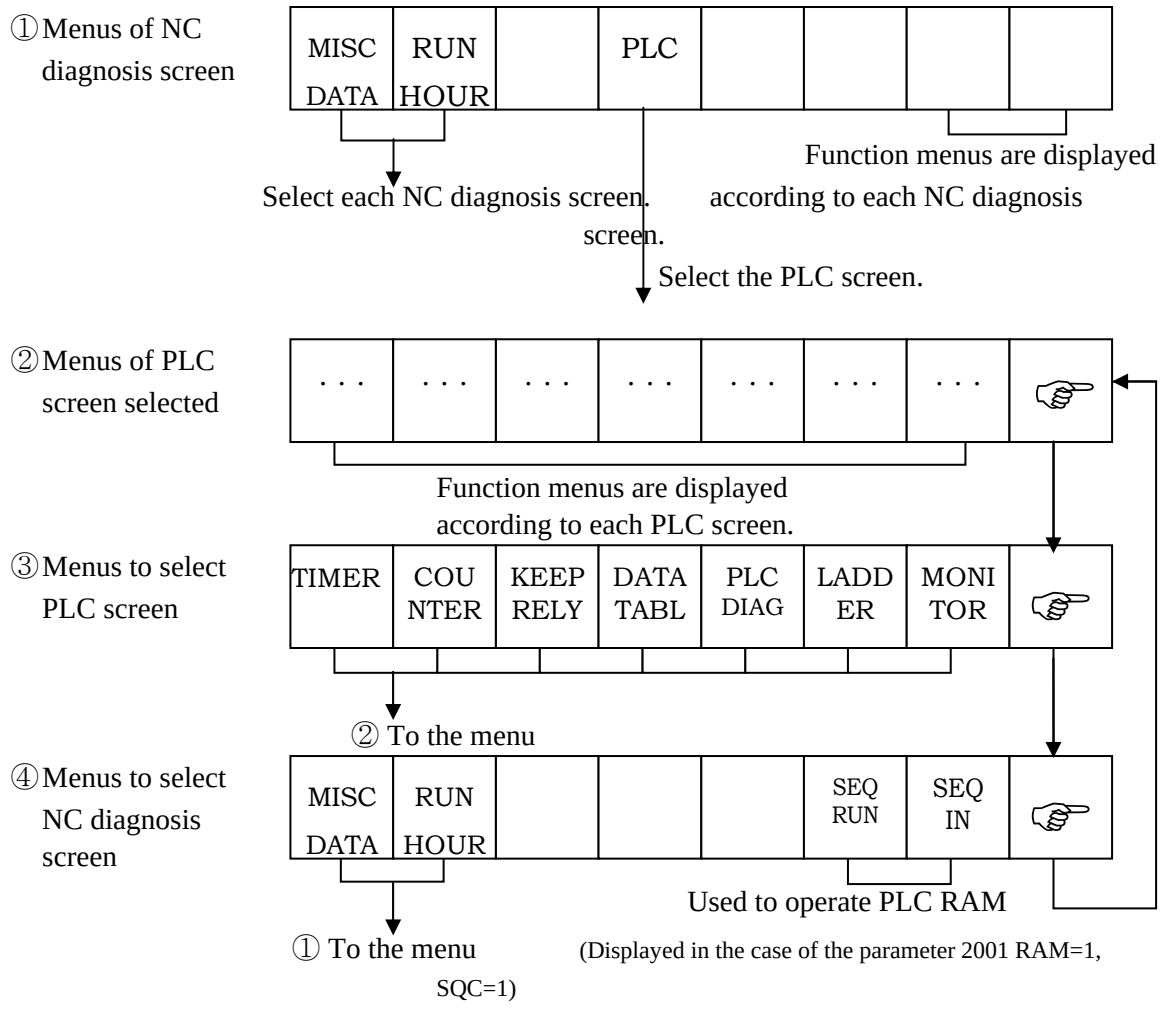
Chapter 6 Self-diagnosis

1. How to View “Diagnosis” Screen

The diagnosis screen shows I/O signals of a machine and the status of internal data. This screen includes 4 menus as followings:

MISC DATA : Displays each data value in the NC and the status of signal on/off.
RUN HOUR : Displays the total result of the NC uptime.
TIMER: Displays and configures the set value of the timer in PLC.
COUNTER: Displays and configures the set value and the current value of the counter in PLC.
KEEP RELAY: Displays and configures the keep relay data in PLC.
DATA TABLE: Displays and configures the data in the data table.
PLC DIAG : Displays the state of on/off for each signal in PLC.
LADDER: Displays ladders and shows and retrieve dynamics of each relay and coil.
MONITOR: Used to check the states of machine I/O signals.

The menus of the diagnosis screen are composed of:



2. PLC Diagnosis

2.1 PLC Signal List 1 (in the order of addresses)

ADDRESS	BIT	SIGNAL	DESCRIPTION
G00	0	*IT	Interlock signal for total axes
	1	*CSL	Interlock signal to start the cutting block
	2	UINT	Macro interrupt signal
	3	SKIP1	Skip signal 1
	4	*ESP	Emergency stop
	5	*SP	Quiescence signal for automatic operation
	6	RRW	Reset & rewind signals
	7	ERS	External reset signal
G01	0	*AIT	Interlock signal for total axes of automatic operation
	1	*BSL	Interlock signal to start a block
	2	AE1	Signal 1 indicating arrival at the measuring
	3	AE2	Signal 2 indicating arrival at the measuring
	4	AE3	Signal 3 indicating arrival at the measuring
	5	SKIP2	Skip signal 2
	6	SKIP3	Skip signal 3
	7	SKIP4	Skip signal 4
G02	0		
	1		
	2		
	3		
	4		
	5		
	6		
	7		
G03	0	ZRN	Selecting signal for ref. point return mode
	1	H	Selecting signal for manual handle feed
	2	J	Selecting signal for continuous manual feed
	3	D	Selecting signal for manual data input
	4	T	Selecting signal for tape instruction
	5	MEM	Selecting signal for memory instruction
	6	EDT	Selecting signal for editing tape memory
	7		
G04	0	AFL	Lock signal for auxiliary functions
	1	DRN	Dryrun signal
	2	BDTI	Optional block skip signal
	3	SBK	Single block signal
	4	OVC	Override cancel signal
	5	ABS	Absolute conversion signal
	6		
	7	MLK	Machine lock signal

ADDRESS	BIT	SIGNAL	DESCRIPTION
G05	0	ST	Startup signal for automatic operation
	1	FIN	Completion signal
	2		
	3		
	4	KEY1	Memory protection key 1
	5	KEY2	Memory protection key 2
	6	KEY3	Memory protection key 3
	7	KEY4	Memory protection key 4
G06	0	SCMP	Spindle clamp
	1	M01	M01 valid/invalid
	2	MP1	Selection of the movement amount by manual handle feed 1
	3	MP2	Selection of the movement amount by manual handle feed 2
	4		
	5	ROV1	Rapid traverse rate 1
	6	ROV2	Rapid traverse rate 2
	7	RT	Selecting signal for manual dispatch
G07	0	BDI2	Optional block skip 2 signal
	1	BDI3	Optional block skip 3 signal
	2	BDI4	Optional block skip 4 signal
	3	BDI5	Optional block skip 5 signal
	4	BDI6	Optional block skip 6 signal
	5	BDI7	Optional block skip 7 signal
	6	BDI8	Optional block skip 8 signal
	7	BDI9	Optional block skip 9 signal
G08	0	*CHF	Chamferring signal
	1		
	2	TLMI	Input signal for measuring the tool lengths
	3	MRET	Input signal for measuring the tool lengths
	4		
	5		
	6	RVS	Reverse movement signal (SENTROL2-C)
	7		
G09	0	TL01	Signal for tool group number
	1	TL02	Signal for tool group number
	2	TL04	Signal for tool group number
	3	TL08	Signal for tool group number
	4	TL16	Signal for tool group number
	5	TL32	Signal for tool group number
	6	TL64	Signal for tool group number
	7	TLSKP	Tool skip signal
G10	0	HS3A	Selection of the manual handle feed axis
	1	HS3B	Selection of the manual handle feed axis
	2	HS3C	Selection of the manual handle feed axis
	3	HS3D	Selection of the manual handle feed axis
	4		
	5		
	6		
	7	TLRST	Reset signal for tool replacement

ADDRESS	BIT	SIGNAL	DESCRIPTION
G11	0	HS1A	Selection of the manual handle feed axis
	1	HS1B	Selection of the manual handle feed axis
	2	HS1C	Selection of the manual handle feed axis
	3	HS1D	Selection of the manual handle feed axis
	4	HS2A	Selection of the manual handle feed axis
	5	HS2B	Selection of the manual handle feed axis
	6	HS2C	Selection of the manual handle feed axis
	7	HS2D	Selection of the manual handle feed axis
G12	0	*FV0	Feed rate override
	1	*FV1	Feed rate override
	2	*FV2	Feed rate override
	3	*FV3	Feed rate override
	4	*FV4	Feed rate override
	5	*FV5	Feed rate override
	6	*FV6	Feed rate override
	7	*FV7	Feed rate override
G15	0	*JV0	Manual feed rate override
	1	*JV1	Manual feed rate override
	2	*JV2	Manual feed rate override
	3	*JV3	Manual feed rate override
	4	*JV4	Manual feed rate override
	5	*JV5	Manual feed rate override
	6	*JV6	Manual feed rate override
	7	*JV7	Manual feed rate override
G16	0	SYNC9	Asynchronous control selecting signal
	1	SYNC10	Asynchronous control selecting signal
	2	SYNC11	Asynchronous control selecting signal
	3	SYNC12	Asynchronous control selecting signal
	4	SYNC13	Asynchronous control selecting signal
	5	SYNC14	Asynchronous control selecting signal
	6	SYNC15	Asynchronous control selecting signal
	7	SYNC16	Asynchronous control selecting signal
G17	0	SYNC1	Asynchronous control selecting signal
	1	SYNC2	Asynchronous control selecting signal
	2	SYNC3	Asynchronous control selecting signal
	3	SYNC4	Asynchronous control selecting signal
	4	SYNC5	Asynchronous control selecting signal
	5	SYNC6	Asynchronous control selecting signal
	6	SYNC7	Asynchronous control selecting signal
	7	SYNC8	Asynchronous control selecting signal
G18	0	SOVR0	Spindle override input
	1	SOVR1	Spindle override input
	2	SOVR2	Spindle override input
	3	SOVR3	Spindle override input
	4	SOVR4	Spindle override input
	5	SOVR5	Spindle override input
	6	SOVR6	Spindle override input
	7	SOVR7	Spindle override input

ADDRESS	BIT	SIGNAL	DESCRIPTION
G19	0	WN1	Search for external work numbers
	1	WN2	Search for external work numbers
	2	WN4	Search for external work numbers
	3	WN8	Search for external work numbers
	4	WN16	Search for external work numbers
	5	WN32	Search for external work numbers
	6	WN64	Search for external work numbers
	7	WN128	Search for external work numbers
G20	0	RI300	Instruction signal for spindle motor speed
	1	RI301	Instruction signal for spindle motor speed
	2	RI302	Instruction signal for spindle motor speed
	3	RI303	Instruction signal for spindle motor speed
	4	RI304	Instruction signal for spindle motor speed
	5	RI305	Instruction signal for spindle motor speed
	6	RI306	Instruction signal for spindle motor speed
	7	RI307	Instruction signal for spindle motor speed
G21	0	RI308	Instruction signal for spindle motor speed
	1	RI309	Instruction signal for spindle motor speed
	2	RI310	Instruction signal for spindle motor speed
	3	RI311	Instruction signal for spindle motor speed
	4		
	5		
	6		
	7	RISGN3	Instruction signal for spindle motor speed
G22	0	RI400	Instruction signal for spindle motor speed
	1	RI401	Instruction signal for spindle motor speed
	2	RI402	Instruction signal for spindle motor speed
	3	RI403	Instruction signal for spindle motor speed
	4	RI404	Instruction signal for spindle motor speed
	5	RI405	Instruction signal for spindle motor speed
	6	RI406	Instruction signal for spindle motor speed
	7	RI407	Instruction signal for spindle motor speed
G23	0	RI408	Instruction signal for spindle motor speed
	1	RI409	Instruction signal for spindle motor speed
	2	RI410	Instruction signal for spindle motor speed
	3	RI411	Instruction signal for spindle motor speed
	4		
	5		
	6		
	7	RISGN4	Instruction signal for spindle motor speed

ADDRESS	BIT	SIGNAL	DESCRIPTION
G24	0	RI100	Instruction signal for spindle motor speed
	1	RI101	Instruction signal for spindle motor speed
	2	RI102	Instruction signal for spindle motor speed
	3	RI103	Instruction signal for spindle motor speed
	4	RI104	Instruction signal for spindle motor speed
	5	RI105	Instruction signal for spindle motor speed
	6	RI106	Instruction signal for spindle motor speed
	7	RI107	Instruction signal for spindle motor speed
G25	0	RI108	Instruction signal for spindle motor speed
	1	RI109	Instruction signal for spindle motor speed
	2	RI110	Instruction signal for spindle motor speed
	3	RI111	Instruction signal for spindle motor speed
	4		
	5		
	6		
	7	RISGN1	Instruction signal for spindle motor speed
G26	0	RI200	Instruction signal for spindle motor speed
	1	RI201	Instruction signal for spindle motor speed
	2	RI202	Instruction signal for spindle motor speed
	3	RI203	Instruction signal for spindle motor speed
	4	RI204	Instruction signal for spindle motor speed
	5	RI205	Instruction signal for spindle motor speed
	6	RI206	Instruction signal for spindle motor speed
	7	RI207	Instruction signal for spindle motor speed
G27	0	RI208	Instruction signal for spindle motor speed
	1	RI209	Instruction signal for spindle motor speed
	2	RI210	Instruction signal for spindle motor speed
	3	RI211	Instruction signal for spindle motor speed
	4		
	5		
	6		
	7	RISGN2	Instruction signal for spindle motor speed
G28	0		
	1		
	2	RGTMD3	Completion signal of rigid selection
	3		
	4	RDY3	All set.
	5	ALMR3	Alarm reset
	6		
	7		
G29	0		
	1	HSP3	High-speed tap signal
	2		
	3		
	4	*ESP3	Emergence stop
	5	CRSRV3	Instruction for reverse rotation
	6	CRSFR3	Instruction for forward rotation
	7	ORCM3	Orient instruction

ADDRESS	BIT	SIGNAL	DESCRIPTION
G30	0		
	1		
	2	RGTMD4	Completion signal of rigid selection
	3		
	4	RDY4	All set.
	5	ALMR4	Alarm reset
	6		
	7		
G31	0		
	1	HSP4	High-speed tap signal
	2		
	3		
	4	*ESP4	Emergency stop
	5	CRSRV4	Instruction for reverse rotation
	6	CRSFR4	Instruction for forward rotation
	7	ORCM4	Orient instruction
G32	0	EXPUN	Start signal of external punch
	1	EXRD	Start signal of external read
	2	EXSTP	Stop signal of external read/punch
	3		
	4		
	5	EOREND	Read completion signal for external data output
	6	ERDRQ	Request signal for external data output
	7	EISTB	Strobe signal for external data input
G33	0	EIA0	Address signal for external data input
	1	EIA1	Address signal for external data input
	2	EIA2	Address signal for external data input
	3	EIA3	Address signal for external data input
	4	EIA4	Address signal for external data input
	5	EIA5	Address signal for external data input
	6	EIA6	Address signal for external data input
	7	EIA7	Address signal for external data input
G34	0	EID0	Data signal for external data input
	1	EID1	Data signal for external data input
	2	EID2	Data signal for external data input
	3	EID3	Data signal for external data input
	4	EID4	Data signal for external data input
	5	EID5	Data signal for external data input
	6	EID6	Data signal for external data input
	7	EID7	Data signal for external data input
G35	0	EID8	Data signal for external data input
	1	EID9	Data signal for external data input
	2	EID10	Data signal for external data input
	3	EID11	Data signal for external data input
	4	EID12	Data signal for external data input
	5	EID13	Data signal for external data input
	6	EID14	Data signal for external data input
	7	EID15	Data signal for external data input

ADDRESS	BIT	SIGNAL	DESCRIPTION
G36	0	EID16	Data signal for external data input
	1	EID17	Data signal for external data input
	2	EID18	Data signal for external data input
	3	EID19	Data signal for external data input
	4	EID20	Data signal for external data input
	5	EID21	Data signal for external data input
	6	EID22	Data signal for external data input
	7	EID23	Data signal for external data input
G37	0	EID24	Data signal for external data input
	1	EID25	Data signal for external data input
	2	EID26	Data signal for external data input
	3	EID27	Data signal for external data input
	4	EID28	Data signal for external data input
	5	EID29	Data signal for external data input
	6	EID30	Data signal for external data input
	7	EID31	Data signal for external data input
G38	0	EID32	Data signal for external data input
	1	EID33	Data signal for external data input
	2	EID34	Data signal for external data input
	3	EID35	Data signal for external data input
	4	EID36	Data signal for external data input
	5	EID37	Data signal for external data input
	6	EID38	Data signal for external data input
	7	EID39	Data signal for external data input
G39	0	EID40	Data signal for external data input
	1	EID41	Data signal for external data input
	2	EID42	Data signal for external data input
	3	EID43	Data signal for external data input
	4	EID44	Data signal for external data input
	5	EID45	Data signal for external data input
	6	EID46	Data signal for external data input
	7	EID47	Data signal for external data input
G40	0	RPB8	Response signal for universal switches of software operator's panel
	1	RPB9	Response signal for universal switches of software operator's panel
	2	RPB10	Response signal for universal switches of software operator's panel
	3	RPB11	Response signal for universal switches of software operator's panel
	4	RPB12	Response signal for universal switches of software operator's panel
	5	RPB13	Response signal for universal switches of software operator's panel
	6	RPB14	Response signal for universal switches of software operator's panel
	7	RPB15	Response signal for universal switches of software operator's panel
G41	0	RPB0	Response signal for universal switches of software operator's panel
	1	RPB1	Response signal for universal switches of software operator's panel
	2	RPB2	Response signal for universal switches of software operator's panel
	3	RPB3	Response signal for universal switches of software operator's panel
	4	RPB4	Response signal for universal switches of software operator's panel
	5	RPB5	Response signal for universal switches of software operator's panel
	6	RPB6	Response signal for universal switches of software operator's panel
	7	RPB7	Response signal for universal switches of software operator's panel

ADDRESS	BIT	SIGNAL	DESCRIPTION
G42	0		
	1		
	2	RIGTMD1	Completion signal of rigid selection
	3		
	4	RDY1	All set.
	5	ALMR1	Alarm reset
	6		
	7		
G43	0		
	1	HSP1	High-speed tap signal
	2		
	3		
	4	*ESP1	Emergency stop
	5	CRSRV1	Instruction for reverse rotation
	6	CRSFR1	Instruction for forward rotation
	7	ORCM1	Orient instruction
G44	0	RPB16	Response signal for universal switches of software operator's panel
	1	RPB17	Response signal for universal switches of software operator's panel
	2	RPB18	Response signal for universal switches of software operator's panel
	3	RPB19	Response signal for universal switches of software operator's panel
	4	RPB20	Response signal for universal switches of software operator's panel
	5	RPB21	Response signal for universal switches of software operator's panel
	6	RPB22	Response signal for universal switches of software operator's panel
	7	RPB23	Response signal for universal switches of software
G45	0		
	1		
	2	RIGTMD2	Completion signal of rigid selection
	3		
	4	RDY2	All set.
	5	ALMR2	Alarm reset
	6		
	7		
G46	0		
	1	HSP2	High-speed tap signal
	2		
	3		
	4	*ESP2	Emergency stop
	5	CRSRV2	Instruction for reverse rotation
	6	CRSFR2	Instruction for forward rotation
	7	ORCM2	Orient instruction
G47	0	TRMOD	Starting tracing function
	1	NOMCL2	Setting nominal clearance
	2	NOMCL3	Setting nominal clearance
	3		
	4		
	5		
	6		
	7		

ADDRESS	BIT	SIGNAL	DESCRIPTION
G48	0	UI000	Input signal for custom macro
	1	UI001	Input signal for custom macro
	2	UI002	Input signal for custom macro
	3	UI003	Input signal for custom macro
	4	UI004	Input signal for custom macro
	5	UI005	Input signal for custom macro
	6	UI006	Input signal for custom macro
	7	UI007	Input signal for custom macro
G49	0	UI008	Input signal for custom macro
	1	UI009	Input signal for custom macro
	2	UI010	Input signal for custom macro
	3	UI011	Input signal for custom macro
	4	UI012	Input signal for custom macro
	5	UI013	Input signal for custom macro
	6	UI014	Input signal for custom macro
	7	UI015	Input signal for custom macro
G50	0	UI016	Input signal for custom macro
	1	UI017	Input signal for custom macro
	2	UI018	Input signal for custom macro
	3	UI019	Input signal for custom macro
	4	UI020	Input signal for custom macro
	5	UI021	Input signal for custom macro
	6	UI022	Input signal for custom macro
	7	UI023	Input signal for custom macro
G51	0	UI024	Input signal for custom macro
	1	UI025	Input signal for custom macro
	2	UI026	Input signal for custom macro
	3	UI027	Input signal for custom macro
	4	UI028	Input signal for custom macro
	5	UI029	Input signal for custom macro
	6	UI030	Input signal for custom macro
	7	UI031	Input signal for custom macro
G52	0	UI100	Input signal for custom macro
	1	UI101	Input signal for custom macro
	2	UI102	Input signal for custom macro
	3	UI103	Input signal for custom macro
	4	UI104	Input signal for custom macro
	5	UI105	Input signal for custom macro
	6	UI106	Input signal for custom macro
	7	UI107	Input signal for custom macro
G53	0	UI108	Input signal for custom macro
	1	UI109	Input signal for custom macro
	2	UI110	Input signal for custom macro
	3	UI111	Input signal for custom macro
	4	UI112	Input signal for custom macro
	5	UI113	Input signal for custom macro
	6	UI114	Input signal for custom macro
	7	UI115	Input signal for custom macro

ADDRESS	BIT	SIGNAL	DESCRIPTION
G54	0	UI116	Input signal for custom macro
	1	UI117	Input signal for custom macro
	2	UI118	Input signal for custom macro
	3	UI119	Input signal for custom macro
	4	UI120	Input signal for custom macro
	5	UI121	Input signal for custom macro
	6	UI122	Input signal for custom macro
	7	UI123	Input signal for custom macro
G55	0	UI124	Input signal for custom macro
	1	UI125	Input signal for custom macro
	2	UI126	Input signal for custom macro
	3	UI127	Input signal for custom macro
	4	UI128	Input signal for custom macro
	5	UI129	Input signal for custom macro
	6	UI130	Input signal for custom macro
	7	UI131	Input signal for custom macro
G56	0	UI200	Input signal for custom macro
	1	UI201	Input signal for custom macro
	2	UI202	Input signal for custom macro
	3	UI203	Input signal for custom macro
	4	UI204	Input signal for custom macro
	5	UI205	Input signal for custom macro
	6	UI206	Input signal for custom macro
	7	UI207	Input signal for custom macro
G57	0	UI208	Input signal for custom macro
	1	UI209	Input signal for custom macro
	2	UI210	Input signal for custom macro
	3	UI211	Input signal for custom macro
	4	UI212	Input signal for custom macro
	5	UI213	Input signal for custom macro
	6	UI214	Input signal for custom macro
	7	UI215	Input signal for custom macro
G58	0	UI216	Input signal for custom macro
	1	UI217	Input signal for custom macro
	2	UI218	Input signal for custom macro
	3	UI219	Input signal for custom macro
	4	UI220	Input signal for custom macro
	5	UI221	Input signal for custom macro
	6	UI222	Input signal for custom macro
	7	UI223	Input signal for custom macro
G59	0	UI224	Input signal for custom macro
	1	UI225	Input signal for custom macro
	2	UI226	Input signal for custom macro
	3	UI227	Input signal for custom macro
	4	UI228	Input signal for custom macro
	5	UI229	Input signal for custom macro
	6	UI230	Input signal for custom macro
	7	UI231	Input signal for custom macro

ADDRESS	BIT	SIGNAL	DESCRIPTION
G60	0	UI300	Input signal for custom macro
	1	UI301	Input signal for custom macro
	2	UI302	Input signal for custom macro
	3	UI303	Input signal for custom macro
	4	UI304	Input signal for custom macro
	5	UI305	Input signal for custom macro
	6	UI306	Input signal for custom macro
	7	UI307	Input signal for custom macro
G61	0	UI308	Input signal for custom macro
	1	UI309	Input signal for custom macro
	2	UI310	Input signal for custom macro
	3	UI311	Input signal for custom macro
	4	UI312	Input signal for custom macro
	5	UI313	Input signal for custom macro
	6	UI314	Input signal for custom macro
	7	UI315	Input signal for custom macro
G62	0	UI316	Input signal for custom macro
	1	UI317	Input signal for custom macro
	2	UI318	Input signal for custom macro
	3	UI319	Input signal for custom macro
	4	UI320	Input signal for custom macro
	5	UI321	Input signal for custom macro
	6	UI322	Input signal for custom macro
	7	UI323	Input signal for custom macro
G63	0	UI324	Input signal for custom macro
	1	UI325	Input signal for custom macro
	2	UI326	Input signal for custom macro
	3	UI027	Input signal for custom macro
	4	UI328	Input signal for custom macro
	5	UI329	Input signal for custom macro
	6	UI330	Input signal for custom macro
	7	UI331	Input signal for custom macro
G64	0	*+L1	Over travel signal
	1	*-L1	Over travel signal
	2		
	3		
	4	*IT1	Interlock signal by axis
	5	HINT1	Interrupt permission for the 1st axis handle
	6	*SVF1	Servo off signal
	7		
G65	0	+J1	Selection signal for feed axis and its direction
	1	-J1	Selection signal for feed axis and its direction
	2	MI1	Mirror image signal
	3	MLK1	Machine lock signal
	4	ADEC1	Automatic ref. point return
	5	PCAX1	Input signal for PLC control axis
	6	+MIT1	Measurement value for offset amount
	7	-MIT1	Measurement value for offset amount

ADDRESS	BIT	SIGNAL	DESCRIPTION
G66	0	EOR00	Overriding the cutting feed rate of the PC control axis
	1	EOR01	Overriding the cutting feed rate of the PC control axis
	2	EOR02	Overriding the cutting feed rate of the PC control axis
	3	EOR03	Overriding the cutting feed rate of the PC control axis
	4	EOR04	Overriding the cutting feed rate of the PC control axis
	5	EOR05	Overriding the cutting feed rate of the PC control axis
	6	EOR06	Overriding the cutting feed rate of the PC control axis
	7	EOR07	Overriding the cutting feed rate of the PC control axis
G67	0	EC00	Axis control instruction
	1	EC01	Axis control instruction
	2	EC02	Axis control instruction
	3	EMSBK1	Prohibition signal against block stop
	4	ESBK1	Block stop signal
	5	ESTP1	Break signal for axis control
	6	ECLR1	Reset signal
	7	EBUF1	Delivery signal for axis control instruction
G68	0	EIF000	Cutting feed rate, spindle speed
	1	EIF001	Cutting feed rate, spindle speed
	2	EIF002	Cutting feed rate, spindle speed
	3	EIF003	Cutting feed rate, spindle speed
	4	EIF004	Cutting feed rate, spindle speed
	5	EIF005	Cutting feed rate, spindle speed
	6	EIF006	Cutting feed rate, spindle speed
	7	EIF007	Cutting feed rate, spindle speed
G69	0	EIF008	Cutting feed rate, spindle speed
	1	EIF009	Cutting feed rate, spindle speed
	2	EIF010	Cutting feed rate, spindle speed
	3	EIF011	Cutting feed rate, spindle speed
	4	EIF012	Cutting feed rate, spindle speed
	5	EIF013	Cutting feed rate, spindle speed
	6	EIF014	Cutting feed rate, spindle speed
	7	EIF015	Cutting feed rate, spindle speed
G70	0	ED000	Axis travel, dwell time, direction of spindle
	1	ED001	Axis travel, dwell time, direction of spindle
	2	ED002	Axis travel, dwell time, direction of spindle
	3	ED003	Axis travel, dwell time, direction of spindle
	4	ED004	Axis travel, dwell time, direction of spindle
	5	ED005	Axis travel, dwell time, direction of spindle
	6	ED006	Axis travel, dwell time, direction of spindle
	7	ED007	Axis travel, dwell time, direction of spindle
G71	0	ED008	Axis travel, dwell time, direction of spindle
	1	ED009	Axis travel, dwell time, direction of spindle
	2	ED010	Axis travel, dwell time, direction of spindle
	3	ED011	Axis travel, dwell time, direction of spindle
	4	ED012	Axis travel, dwell time, direction of spindle
	5	ED013	Axis travel, dwell time, direction of spindle
	6	ED014	Axis travel, dwell time, direction of spindle
	7	ED015	Axis travel, dwell time, direction of spindle

ADDRESS	BIT	SIGNAL	DESCRIPTION
G72	0	ED016	Axis travel, dwell time, direction of spindle
	1	ED017	Axis travel, dwell time, direction of spindle
	2	ED018	Axis travel, dwell time, direction of spindle
	3	ED019	Axis travel, dwell time, direction of spindle
	4	ED020	Axis travel, dwell time, direction of spindle
	5	ED021	Axis travel, dwell time, direction of spindle
	6	ED022	Axis travel, dwell time, direction of spindle
	7	ED023	Axis travel, dwell time, direction of spindle
G73	0	ED024	Axis travel, dwell time, direction of spindle
	1	ED025	Axis travel, dwell time, direction of spindle
	2	ED026	Axis travel, dwell time, direction of spindle
	3	ED027	Axis travel, dwell time, direction of spindle
	4	ED028	Axis travel, dwell time, direction of spindle
	5	ED029	Axis travel, dwell time, direction of spindle
	6	ED030	Axis travel, dwell time, direction of spindle
	7	ED031	Axis travel, dwell time, direction of spindle

Same as G64~G73 (1st axis) to the rest.

(G74~G83) 2nd axis (G144~G153) 9th axis
(G84~G93) 3rd axis (G154~G163) 10th axis
(G94~G103) 4th axis (G164~G173) 11th axis
(G104~G113) 5th axis (G174~G183) 12th axis
(G114~G123) 6th axis (G184~G193) 13th axis
(G124~G133) 7th axis (G194~G203) 14th axis
(G134~G143) 8th axis (G204~G213) 15th axis
(G214~G223) 16th axis

ADDRESS	BIT	SIGNAL	DESCRIPTION
G224	0	HSF00	Handle Feed Step Data
	1	HSF01	Handle Feed Step Data
	2	HSF02	Handle Feed Step Data
	3	HSF03	Handle Feed Step Data
	4	HSF04	Handle Feed Step Data
	5	HSF05	Handle Feed Step Data
	6	HSF06	Handle Feed Step Data
	7	HSF07	Handle Feed Step Data
G225	0	HSF08	Handle Feed Step Data
	1	HSF09	Handle Feed Step Data
	2	HSF10	Handle Feed Step Data
	3	HSF11	Handle Feed Step Data
	4	HSF12	Handle Feed Step Data
	5	HSF13	Handle Feed Step Data
	6	HSF14	Handle Feed Step Data
	7	HSF15	Handle Feed Step Data

ADDRESS	BIT	SIGNAL	DESCRIPTION	
G226	0	HSF16	Handle Feed Step Data	
	1	HSF17	Handle Feed Step Data	
	2	HSF18	Handle Feed Step Data	
	3	HSF19	Handle Feed Step Data	
	4	HSF20	Handle Feed Step Data	
	5	HSF21	Handle Feed Step Data	
	6	HSF22	Handle Feed Step Data	
	7	HSF23	Handle Feed Step Data	
G227	0	HSF24	Handle Feed Step Data	
	1	HSF25	Handle Feed Step Data	
	2	HSF26	Handle Feed Step Data	
	3	HSF27	Handle Feed Step Data	
	4	HSF28	Handle Feed Step Data	
	5	HSF29	Handle Feed Step Data	
	6	HSF30	Handle Feed Step Data	
	7	HSFON	Effective Handle Feed Step	
G228	0	ZRN11	1st axis	1st ref. point return
	1	ZRN12	1st axis	2nd ref. point return
	2	ZRN13	1st axis	3rd ref. point return
	3	ZRN14	1st axis	4th ref. point return
	4	ZRN21	2nd axis	1st ref. point return
	5	ZRN22	2nd axis	2nd ref. point return
	6	ZRN23	2nd axis	3rd ref. point return
	7	ZRN24	2nd axis	4th ref. point return
G229	0	ZRN31	3rd axis	1st ref. point return
	1	ZRN32	3rd axis	2nd ref. point return
	2	ZRN33	3rd axis	3rd ref. point return
	3	ZRN34	3rd axis	4th ref. point return
	4	ZRN41	4th axis	1st ref. point return
	5	ZRN42	4th axis	2nd ref. point return
	6	ZRN43	4th axis	3rd ref. point return
	7	ZRN44	4th axis	4th ref. point return
G230	0	ZRN51	5th axis	1st ref. point return
	1	ZRN52	5th axis	2nd ref. point return
	2	ZRN53	5th axis	3rd ref. point return
	3	ZRN54	5th axis	4th ref. point return
	4	ZRN61	6th axis	1st ref. point return
	5	ZRN62	6th axis	2nd ref. point return
	6	ZRN63	6th axis	3rd ref. point return
	7	ZRN64	6th axis	4th ref. point return
G231	0	ZRN71	7th axis	1st ref. point return
	1	ZRN72	7th axis	2nd ref. point return
	2	ZRN73	7th axis	3rd ref. point return
	3	ZRN74	7th axis	4th ref. point return
	4	ZRN81	8th axis	1st ref. point return
	5	ZRN82	8th axis	2nd ref. point return
	6	ZRN83	8th axis	3rd ref. point return
	7	ZRN84	8th axis	4th ref. point return

ADDRESS	BIT	SIGNAL	DESCRIPTION	
G232	0	ZRN91	9th axis	1st ref. point return
	1	ZRN92	9th axis	2nd ref. point return
	2	ZRN93	9th axis	3rd ref. point return
	3	ZRN94	9th axis	4th ref. point return
	4	ZRNA1	10th axis	1st ref. point return
	5	ZRNA2	10th axis	2nd ref. point return
	6	ZRNA3	10th axis	3rd ref. point return
	7	ZRNA4	10th axis	4th ref. point return
G233	0	ZRNB1	11th axis	1st ref. point return
	1	ZRNB2	11th axis	2nd ref. point return
	2	ZRNB3	11th axis	3rd ref. point return
	3	ZRNB4	11th axis	4th ref. point return
	4	ZRNC1	12th axis	1st ref. point return
	5	ZRNC2	12th axis	2nd ref. point return
	6	ZRNC3	12th axis	3rd ref. point return
	7	ZRNC4	12th axis	4th ref. point return
G234	0	ZRND1	13th axis	1st ref. point return
	1	ZRND2	13th axis	2nd ref. point return
	2	ZRND3	13th axis	3rd ref. point return
	3	ZRND4	13th axis	4th ref. point return
	4	ZRNE1	14th axis	1st ref. point return
	5	ZRNE2	14th axis	2nd ref. point return
	6	ZRNE3	14th axis	3rd ref. point return
	7	ZRNE4	14th axis	4th ref. point return
G235	0	ZRNF1	15th axis	1st ref. point return
	1	ZRNF2	15th axis	2nd ref. point return
	2	ZRNF3	15th axis	3rd ref. point return
	3	ZRNF4	15th axis	4th ref. point return
	4	ZRNG1	16th axis	1st ref. point return
	5	ZRNG2	16th axis	2nd ref. point return
	6	ZRNG3	16th axis	3rd ref. point return
	7	ZRNG4	16th axis	4th ref. point return
G236	0	PATCR	External return key for working setup	
	1	PATUP	External cursor up key for working setup	
	2	PATDWN	External cursor down key for working setup	
	3	ASET	Indication number setting for working setup in automatic system mode	
	4	MSET	Indication number setting for working setup in manual system mode	
	5			
	6			
	7			
G237	0	PAT*1	Indication number setting for working setup *1	
	1	PAT*2	Indication number setting for working setup *2	
	2	PAT*4	Indication number setting for working setup *4	
	3	PAT*8	Indication number setting for working setup *8	
	4	PAT*16	Indication number setting for working setup *16	
	5	PAT*32	Indication number setting for working setup *32	
	6	PAT*64	Indication number setting for working setup *64	
	7			

ADDRESS	BIT	SIGNAL	DESCRIPTION
G238	0	JGPS01	1st axis movement through rapid feed of the jog designated by value of machine coordinates
	1	JGPS02	2nd axis movement through rapid feed of the jog designated by value of machine coordinates
	2	JGPS03	3rd axis movement through rapid feed of the jog designated by value of machine coordinates
	3	JGPS04	4th axis movement through rapid feed of the jog designated by value of machine coordinates
	4	JGPS05	5th axis movement through rapid feed of the jog designated by value of machine coordinates
	5	JGPS06	6th axis movement through rapid feed of the jog designated by value of machine coordinates
	6	JGPS07	7th axis movement through rapid feed of the jog designated by value of machine coordinates
	7	JGPS08	8th axis movement through rapid feed of the jog designated by value of machine coordinates
G239	0	JGPS09	9th axis movement through rapid feed of the jog designated by value of machine coordinates
	1	JGPS10	10th axis movement through rapid feed of the jog designated by value of machine coordinates
	2	JGPS11	11th axis movement through rapid feed of the jog designated by value of machine coordinates
	3	JGPS12	12th axis movement through rapid feed of the jog designated by value of machine coordinates
	4	JGPS13	13th axis movement through rapid feed of the jog designated by value of machine coordinates
	5	JGPS14	14th axis movement through rapid feed of the jog designated by value of machine coordinates
	6	JGPS15	15th axis movement through rapid feed of the jog designated by value of machine coordinates
	7	JGPS16	16th axis movement through rapid feed of the jog designated by value of machine coordinates
G240	0	CAL101	O9700 Executing calculation of the line 1 text
	1	CAL102	O9700 Executing calculation of the line 2 text
	2	CAL103	O9700 Executing calculation of the line 3 text
	3	CAL104	O9700 Executing calculation of the line 4 text
	4	CAL105	O9700 Executing calculation of the line 5 text
	5	CAL106	O9700 Executing calculation of the line 6 text
	6	CAL107	O9700 Executing calculation of the line 7 text
	7	CAL108	O9700 Executing calculation of the line 8 text
G241	0	CAL109	O9700 Executing calculation of the line 9 text
	1	CAL110	O9700 Executing calculation of the line 10 text
	2	CAL111	O9700 Executing calculation of the line 11 text
	3	CAL112	O9700 Executing calculation of the line 12 text
	4	CAL113	O9700 Executing calculation of the line 13 text
	5	CAL114	O9700 Executing calculation of the line 14 text
	6	CAL115	O9700 Executing calculation of the line 15 text
	7	CAL116	O9700 Executing calculation of the line 16 text
G242	0	CAL201	O9701 Executing calculation of the line 1 text
	1	CAL202	O9701 Executing calculation of the line 2 text
	2	CAL203	O9701 Executing calculation of the line 3 text
	3	CAL204	O9701 Executing calculation of the line 4 text
	4	CAL205	O9701 Executing calculation of the line 5 text
	5	CAL206	O9701 Executing calculation of the line 6 text
	6	CAL207	O9701 Executing calculation of the line 7 text
	7	CAL208	O9701 Executing calculation of the line 8 text
G243	0	CAL209	O9701 Executing calculation of the line 9 text
	1	CAL210	O9701 Executing calculation of the line 10 text
	2	CAL211	O9701 Executing calculation of the line 11 text
	3	CAL212	O9701 Executing calculation of the line 12 text
	4	CAL213	O9701 Executing calculation of the line 13 text
	5	CAL214	O9701 Executing calculation of the line 14 text
	6	CAL215	O9701 Executing calculation of the line 15 text
	7	CAL216	O9701 Executing calculation of the line 16 text

Same as G240.0~G241.7 (CAL101~116 O9700) and
G242.0~G243.7 (CAL201~216 O9701) to the rest.
G244.0~G245.7 (CAL301~316 O9702)
G246.0~G247.7 (CAL401~416 O9703)
G248.0~G249.7 (CAL501~516 O9704)
G250.0~G251.7 (CAL601~616 O9705)
G252.0~G253.7 (CAL701~716 O9706)
G254.0~G255.7 (CAL801~816 O9707)

ADDRESS	BIT	SIGNAL	DESCRIPTION
F00	0		
	1	AL	Singal during alarming
	2	RST	Signal during reset
	3	SPL	Signal during quiescence of automatic operation
	4	STL	Signal during startup of automatic operation
	5	OP	Signal during automatic operation
	6	SA	Completion signal for servo ready
	7	MA	Completion signal for control unit ready
F01	0	DEN	Completion signal for distribution
	1	IPEN	Completion signal for distribution
	2	DST	Startup signal for manual data input
	3	INCH	Input signal for inch
	4	TAP	Signal during tapping
	5	RPD	Signal during rapid feed
	6	THRD	Signal during threading screws
	7	CSS	Signal during constant primary speed
F02	0		
	1	CUT	Signal during cutting
	2	*ESPM	Emergency stop
	3	DSP	Feed hold key
	4	TLMO	Output signal for measuring tool length
	5	ROTMV	Status output signal during movement of rotatation axis
	6		
	7		
F03	0	MZRN	Notification signal for ref. point return mode
	1	MH	Validation signal for selecting manual handle feed
	2	MJ	Validation signal for selecting manual continuous feed
	3	MD	Validation signal for selecting manual data input
	4	MT	Validation signal for selecting tape instruction
	5	MMEM	Validation signal for selecting memory instruction
	6	MEDT	Validation signal for selecting tape memory edit
	7		
F04	0	MAFL	Validation signal for locking auxiliary functions
	1	MDRN	Validation signal for dryrun
	2	MBDT1	Validation signal for optional block skip 1
	3	MSBK	Validation signal for single block
	4	MM01	M01 switch of software operator's panel
	5	MABS	Validation signal for converting to absolute
	6		
	7	MMLK	Validation signal for machine lock
F05	0	MBDI2	Validation signal for optional block skip 2
	1	MBDI3	Validation signal for optional block skip 3
	2	MBDI4	Validation signal for optional block skip 4
	3	MBDI5	Validation signal for optional block skip 5
	4	MBDI6	Validation signal for optional block skip 6
	5	MBDI7	Validation signal for optional block skip 7
	6	MBDI8	Validation signal for optional block skip 8
	7	MBDI9	Validation signal for optional block skip 9

ADDRESS	BIT	SIGNAL	DESCRIPTION
F06	0	PSALM	Alarm for program operation error
	1	SVALM	Servo alarm
	2	OHALM	Over heat alarm
	3	OTALM	Over travel alarm
	4	SYALM	Alarm for abnormality of control unit
	5	MFOC	Feed override cancel
	6	MSOC	Spindle override cancel
	7	MKEY	Protection key switch for software operator's panel
F07	0	EMGLS	Emergency L/S signal
	1	EDTCHK	Check signal for automatic operation (edit mode)
	2	SMPON	Signal for servo main power on
	3	RTAP	Status signal of rigid mode
	4	RPBSY	Signal during read/punch
	5	ESEND	Completion signal for external search
	6	TLCHA	Signal for tool replacement
	7	TLCHB	Signal for tool replacement
F08	0	MF	Strobe signal for auxiliary functions
	1	SF	Strobe signal for spindle function
	2	TF	Stroble signal for tool function
	3	BF	Strobe signal for the 2nd auxiliary functions
	4		
	5		
	6		
	7		
F09	0		
	1		
	2		
	3		
	4	DM00	Decode M signal
	5	DM01	Decode M signal
	6	DM02	Decode M signal
	7	DM30	Decode M signal
F10	0	RO00	Speed signal of instructing spindle
	1	RO01	Speed signal of instructing spindle
	2	RO02	Speed signal of instructing spindle
	3	RO03	Speed signal of instructing spindle
	4	RO04	Speed signal of instructing spindle
	5	RO05	Speed signal of instructing spindle
	6	RO06	Speed signal of instructing spindle
	7	RO07	Speed signal of instructing spindle
F11	0	RO08	Speed signal of instructing spindle
	1	RO09	Speed signal of instructing spindle
	2	RO10	Speed signal of instructing spindle
	3	RO11	Speed signal of instructing spindle
	4	RO12	Speed signal of instructing spindle
	5	RO13	Speed signal of instructing spindle
	6	RO14	Speed signal of instructing spindle
	7	RO15	Speed signal of instructing spindle

ADDRESS	BIT	SIGNAL	DESCRIPTION
F12	0	AR00	Actual speed signal of spindle
	1	AR01	Actual speed signal of spindle
	2	AR02	Actual speed signal of spindle
	3	AR03	Actual speed signal of spindle
	4	AR04	Actual speed signal of spindle
	5	AR05	Actual speed signal of spindle
	6	AR06	Actual speed signal of spindle
	7	AR07	Actual speed signal of spindle
F13	0	AR08	Actual speed signal of spindle
	1	AR09	Actual speed signal of spindle
	2	AR10	Actual speed signal of spindle
	3	AR11	Actual speed signal of spindle
	4	AR12	Actual speed signal of spindle
	5	AR13	Actual speed signal of spindle
	6	AR14	Actual speed signal of spindle
	7	AR15	Actual speed signal of spindle
F14	0	MR00	Signal for maximum speed of spindle
	1	MR01	Signal for maximum speed of spindle
	2	MR02	Signal for maximum speed of spindle
	3	MR03	Signal for maximum speed of spindle
	4	MR04	Signal for maximum speed of spindle
	5	MR05	Signal for maximum speed of spindle
	6	MR06	Signal for maximum speed of spindle
	7	MR07	Signal for maximum speed of spindle
F15	0	MR08	Signal for maximum speed of spindle
	1	MR09	Signal for maximum speed of spindle
	2	MR10	Signal for maximum speed of spindle
	3	MR11	Signal for maximum speed of spindle
	4	MR12	Signal for maximum speed of spindle
	5	MR13	Signal for maximum speed of spindle
	6	MR14	Signal for maximum speed of spindle
	7	MR15	Signal for maximum speed of spindle
F16	0	M00	Code signal for auxiliary functions
	1	M01	Code signal for auxiliary functions
	2	M02	Code signal for auxiliary functions
	3	M03	Code signal for auxiliary functions
	4	M04	Code signal for auxiliary functions
	5	M05	Code signal for auxiliary functions
	6	M06	Code signal for auxiliary functions
	7	M07	Code signal for auxiliary functions
F17	0	M08	Code signal for auxiliary functions
	1	M09	Code signal for auxiliary functions
	2	M10	Code signal for auxiliary functions
	3	M11	Code signal for auxiliary functions
	4	M12	Code signal for auxiliary functions
	5	M13	Code signal for auxiliary functions
	6	M14	Code signal for auxiliary functions
	7	M15	Code signal for auxiliary functions

ADDRESS	BIT	SIGNAL	DESCRIPTION
F18	0	M16	Code signal for auxiliary functions
	1	M17	Code signal for auxiliary functions
	2	M18	Code signal for auxiliary functions
	3	M19	Code signal for auxiliary functions
	4	M20	Code signal for auxiliary functions
	5	M21	Code signal for auxiliary functions
	6	M22	Code signal for auxiliary functions
	7	M23	Code signal for auxiliary functions
F19	0	M24	Code signal for auxiliary functions
	1	M25	Code signal for auxiliary functions
	2	M26	Code signal for auxiliary functions
	3	M27	Code signal for auxiliary functions
	4	M28	Code signal for auxiliary functions
	5	M29	Code signal for auxiliary functions
	6	M30	Code signal for auxiliary functions
	7	M31	Code signal for auxiliary functions
F20	0	S00	Code signal for spindle function
	1	S01	Code signal for spindle function
	2	S02	Code signal for spindle function
	3	S03	Code signal for spindle function
	4	S04	Code signal for spindle function
	5	S05	Code signal for spindle function
	6	S06	Code signal for spindle function
	7	S07	Code signal for spindle function
F21	0	S08	Code signal for spindle function
	1	S09	Code signal for spindle function
	2	S10	Code signal for spindle function
	3	S11	Code signal for spindle function
	4	S12	Code signal for spindle function
	5	S13	Code signal for spindle function
	6	S14	Code signal for spindle function
	7	S15	Code signal for spindle function
F22	0	S16	Code signal for spindle function
	1	S17	Code signal for spindle function
	2	S18	Code signal for spindle function
	3	S19	Code signal for spindle function
	4	S20	Code signal for spindle function
	5	S21	Code signal for spindle function
	6	S22	Code signal for spindle function
	7	S23	Code signal for spindle function
F23	0	S24	Code signal for spindle function
	1	S25	Code signal for spindle function
	2	S26	Code signal for spindle function
	3	S27	Code signal for spindle function
	4	S28	Code signal for spindle function
	5	S29	Code signal for spindle function
	6	S30	Code signal for spindle function
	7	S31	Code signal for spindle function

ADDRESS	BIT	SIGNAL	DESCRIPTION
F24	0	T00	Code signal for tool function
	1	T01	Code signal for tool function
	2	T02	Code signal for tool function
	3	T03	Code signal for tool function
	4	T04	Code signal for tool function
	5	T05	Code signal for tool function
	6	T06	Code signal for tool function
	7	T07	Code signal for tool function
F25	0	T08	Code signal for tool function
	1	T09	Code signal for tool function
	2	T10	Code signal for tool function
	3	T11	Code signal for tool function
	4	T12	Code signal for tool function
	5	T13	Code signal for tool function
	6	T14	Code signal for tool function
	7	T15	Code signal for tool function
F26	0	T16	Code signal for tool function
	1	T17	Code signal for tool function
	2	T18	Code signal for tool function
	3	T19	Code signal for tool function
	4	T20	Code signal for tool function
	5	T21	Code signal for tool function
	6	T22	Code signal for tool function
	7	T23	Code signal for tool function
F27	0	T24	Code signal for tool function
	1	T25	Code signal for tool function
	2	T26	Code signal for tool function
	3	T27	Code signal for tool function
	4	T28	Code signal for tool function
	5	T29	Code signal for tool function
	6	T30	Code signal for tool function
	7	T31	Code signal for tool function
F28	0	B00	Code signal for the 2nd auxiliary functions
	1	B01	Code signal for the 2nd auxiliary functions
	2	B02	Code signal for the 2nd auxiliary functions
	3	B03	Code signal for the 2nd auxiliary functions
	4	B04	Code signal for the 2nd auxiliary functions
	5	B05	Code signal for the 2nd auxiliary functions
	6	B06	Code signal for the 2nd auxiliary functions
	7	B07	Code signal for the 2nd auxiliary functions
F29	0	B08	Code signal for the 2nd auxiliary functions
	1	B09	Code signal for the 2nd auxiliary functions
	2	B10	Code signal for the 2nd auxiliary functions
	3	B11	Code signal for the 2nd auxiliary functions
	4	B12	Code signal for the 2nd auxiliary functions
	5	B13	Code signal for the 2nd auxiliary functions
	6	B14	Code signal for the 2nd auxiliary functions
	7	B15	Code signal for the 2nd auxiliary functions

ADDRESS	BIT	SIGNAL	DESCRIPTION
F30	0	B16	Code signal for the 2nd auxiliary functions
	1	B17	Code signal for the 2nd auxiliary functions
	2	B18	Code signal for the 2nd auxiliary functions
	3	B19	Code signal for the 2nd auxiliary functions
	4	B20	Code signal for the 2nd auxiliary functions
	5	B21	Code signal for the 2nd auxiliary functions
	6	B22	Code signal for the 2nd auxiliary functions
	7	B23	Code signal for the 2nd auxiliary functions
F31	0	B24	Code signal for the 2nd auxiliary functions
	1	B25	Code signal for the 2nd auxiliary functions
	2	B26	Code signal for the 2nd auxiliary functions
	3	B27	Code signal for the 2nd auxiliary functions
	4	B28	Code signal for the 2nd auxiliary functions
	5	B29	Code signal for the 2nd auxiliary functions
	6	B30	Code signal for the 2nd auxiliary functions
	7	B31	Code signal for the 2nd auxiliary functions
F32	0	PRECH	Nominal clearance state
	1	FAR	Far state
	2	COLLIS	Collision state
	3		
	4		
	5	EIREND	Read completion signal for external data input
	6		
	7	EOSTB	Strobe signal for external data output
F33	0	EOA0	Address signal for external data output
	1	EOA1	Address signal for external data output
	2	EOA2	Address signal for external data output
	3	EOA3	Address signal for external data output
	4	EOA4	Address signal for external data output
	5	EOA5	Address signal for external data output
	6	EOA6	Address signal for external data output
	7	EOA7	Address signal for external data output
F34	0	EOD00	Data signal for external data output
	1	EOD01	Data signal for external data output
	2	EOD02	Data signal for external data output
	3	EOD03	Data signal for external data output
	4	EOD04	Data signal for external data output
	5	EOD05	Data signal for external data output
	6	EOD06	Data signal for external data output
	7	EOD07	Data signal for external data output
F35	0	EOD08	Data signal for external data output
	1	EOD09	Data signal for external data output
	2	EOD10	Data signal for external data output
	3	EOD11	Data signal for external data output
	4	EOD12	Data signal for external data output
	5	EOD13	Data signal for external data output
	6	EOD14	Data signal for external data output
	7	EOD15	Data signal for external data output

ADDRESS	BIT	SIGNAL	DESCRIPTION
F36	0	EOD16	Data signal for external data output
	1	EOD17	Data signal for external data output
	2	EOD18	Data signal for external data output
	3	EOD19	Data signal for external data output
	4	EOD20	Data signal for external data output
	5	EOD21	Data signal for external data output
	6	EOD22	Data signal for external data output
	7	EOD23	Data signal for external data output
F37	0	EOD24	Data signal for external data output
	1	EOD25	Data signal for external data output
	2	EOD26	Data signal for external data output
	3	EOD27	Data signal for external data output
	4	EOD28	Data signal for external data output
	5	EOD29	Data signal for external data output
	6	EOD30	Data signal for external data output
	7	EOD31	Data signal for external data output
F38	0	EOD32	Data signal for external data output
	1	EOD33	Data signal for external data output
	2	EOD34	Data signal for external data output
	3	EOD35	Data signal for external data output
	4	EOD36	Data signal for external data output
	5	EOD37	Data signal for external data output
	6	EOD38	Data signal for external data output
	7	EOD39	Data signal for external data output
F39	0	EOD40	Data signal for external data output
	1	EOD41	Data signal for external data output
	2	EOD42	Data signal for external data output
	3	EOD43	Data signal for external data output
	4	EOD44	Data signal for external data output
	5	EOD45	Data signal for external data output
	6	EOD46	Data signal for external data output
	7	EOD47	Data signal for external data output
F40	0	SOR0	Spindle override
	1	SOR1	Spindle override
	2	SOR2	Spindle override
	3	SOR3	Spindle override
	4	SOR4	Spindle override
	5	SOR5	Spindle override
	6	SOR6	Spindle override
	7	SOR7	Spindle override
F41	0		
	1		
	2		
	3		
	4	ORAR2	Orient completion signal
	5	*SPAL2	Spindle trouble signal
	6	SST2	Zero speed signal
	7	SARM2	Signal for indicating access to a designated speed

ADDRESS	BIT	SIGNAL	DESCRIPTION
F42	0	PB8	Universal switches of software operator's panel
	1	PB9	Universal switches of software operator's panel
	2	PB10	Universal switches of software operator's panel
	3	PB11	Universal switches of software operator's panel
	4	PB12	Universal switches of software operator's panel
	5	PB13	Universal switches of software operator's panel
	6	PB14	Universal switches of software operator's panel
	7	PB15	Universal switches of software operator's panel
F43	0	PB0	Universal switches of software operator's panel
	1	PB1	Universal switches of software operator's panel
	2	PB2	Universal switches of software operator's panel
	3	PB3	Universal switches of software operator's panel
	4	PB4	Universal switches of software operator's panel
	5	PB5	Universal switches of software operator's panel
	6	PB6	Universal switches of software operator's panel
	7	PB7	Universal switches of software operator's panel
F44	0		
	1		
	2		
	3		
	4	ORAR1	Orient completion signal
	5	*SPAL1	Spindle trouble signal
	6	SST1	Zero speed signal
	7	SARM1	Signal for indicating access to a designated speed
F45	0	PB16	Universal switches of software operator's panel
	1	PB17	Universal switches of software operator's panel
	2	PB18	Universal switches of software operator's panel
	3	PB19	Universal switches of software operator's panel
	4	PB20	Universal switches of software operator's panel
	5	PB21	Universal switches of software operator's panel
	6	PB22	Universal switches of software operator's panel
	7	PB23	Universal switches of software operator's panel
F46	0	RAFL	Request for auxiliary function lock
	1	RDRN	Request for dryrun
	2	RBDT1	Request for optional block skip
	3	RSBK	Request for single block
	4	RM01	Request for M01
	5	RABS	Request for manual absolute
	6	ROVC	Request for feed override cancel
	7	RMLK	Request for machine lock
F47	0	RCLMA	Requesting output signal for software operator's panel
	1	SUCLP	Request signal for unclamping the spindle
	2	SCLP	Request signal for clamping the spindle
	3		
	4		
	5	RCHIP	Requesting output signal for software operator's panel
	6		
	7	RCLCA	Requesting output signal for software operator's panel

ADDRESS	BIT	SIGNAL	DESCRIPTION
F48	0	UO000	Output signal for custom macro
	1	UO001	Output signal for custom macro
	2	UO002	Output signal for custom macro
	3	UO003	Output signal for custom macro
	4	UO004	Output signal for custom macro
	5	UO005	Output signal for custom macro
	6	UO006	Output signal for custom macro
	7	UO007	Output signal for custom macro
F49	0	UO008	Output signal for custom macro
	1	UO009	Output signal for custom macro
	2	UO010	Output signal for custom macro
	3	UO011	Output signal for custom macro
	4	UO012	Output signal for custom macro
	5	UO013	Output signal for custom macro
	6	UO014	Output signal for custom macro
	7	UO015	Output signal for custom macro
F50	0	UO016	Output signal for custom macro
	1	UO017	Output signal for custom macro
	2	UO018	Output signal for custom macro
	3	UO019	Output signal for custom macro
	4	UO020	Output signal for custom macro
	5	UO021	Output signal for custom macro
	6	UO022	Output signal for custom macro
	7	UO023	Output signal for custom macro
F51	0	UO024	Output signal for custom macro
	1	UO025	Output signal for custom macro
	2	UO026	Output signal for custom macro
	3	UO027	Output signal for custom macro
	4	UO028	Output signal for custom macro
	5	UO029	Output signal for custom macro
	6	UO030	Output signal for custom macro
	7	UO031	Output signal for custom macro
F52	0	UO100	Output signal for custom macro
	1	UO101	Output signal for custom macro
	2	UO102	Output signal for custom macro
	3	UO103	Output signal for custom macro
	4	UO104	Output signal for custom macro
	5	UO105	Output signal for custom macro
	6	UO106	Output signal for custom macro
	7	UO107	Output signal for custom macro
F53	0	UO108	Output signal for custom macro
	1	UO109	Output signal for custom macro
	2	UO110	Output signal for custom macro
	3	UO111	Output signal for custom macro
	4	UO112	Output signal for custom macro
	5	UO113	Output signal for custom macro
	6	UO114	Output signal for custom macro
	7	UO115	Output signal for custom macro

ADDRESS	BIT	SIGNAL	DESCRIPTION
F54	0	UO116	Output signal for custom macro
	1	UO117	Output signal for custom macro
	2	UO118	Output signal for custom macro
	3	UO119	Output signal for custom macro
	4	UO120	Output signal for custom macro
	5	UO121	Output signal for custom macro
	6	UO122	Output signal for custom macro
	7	UO123	Output signal for custom macro
F55	0	UO124	Output signal for custom macro
	1	UO125	Output signal for custom macro
	2	UO126	Output signal for custom macro
	3	UO127	Output signal for custom macro
	4	UO128	Output signal for custom macro
	5	UO129	Output signal for custom macro
	6	UO130	Output signal for custom macro
	7	UO131	Output signal for custom macro
F56	0	UO200	Output signal for custom macro
	1	UO201	Output signal for custom macro
	2	UO202	Output signal for custom macro
	3	UO203	Output signal for custom macro
	4	UO204	Output signal for custom macro
	5	UO205	Output signal for custom macro
	6	UO206	Output signal for custom macro
	7	UO207	Output signal for custom macro
F57	0	UO208	Output signal for custom macro
	1	UO209	Output signal for custom macro
	2	UO210	Output signal for custom macro
	3	UO211	Output signal for custom macro
	4	UO212	Output signal for custom macro
	5	UO213	Output signal for custom macro
	6	UO214	Output signal for custom macro
	7	UO215	Output signal for custom macro
F58	0	UO216	Output signal for custom macro
	1	UO217	Output signal for custom macro
	2	UO218	Output signal for custom macro
	3	UO219	Output signal for custom macro
	4	UO220	Output signal for custom macro
	5	UO221	Output signal for custom macro
	6	UO222	Output signal for custom macro
	7	UO223	Output signal for custom macro
F59	0	UO224	Output signal for custom macro
	1	UO225	Output signal for custom macro
	2	UO226	Output signal for custom macro
	3	UO227	Output signal for custom macro
	4	UO228	Output signal for custom macro
	5	UO229	Output signal for custom macro
	6	UO230	Output signal for custom macro
	7	UO231	Output signal for custom macro

ADDRESS	BIT	SIGNAL	DESCRIPTION
F60	0	UO300	Output signal for custom macro
	1	UO301	Output signal for custom macro
	2	UO302	Output signal for custom macro
	3	UO303	Output signal for custom macro
	4	UO304	Output signal for custom macro
	5	UO305	Output signal for custom macro
	6	UO306	Output signal for custom macro
	7	UO307	Output signal for custom macro
F61	0	UO308	Output signal for custom macro
	1	UO309	Output signal for custom macro
	2	UO310	Output signal for custom macro
	3	UO311	Output signal for custom macro
	4	UO312	Output signal for custom macro
	5	UO313	Output signal for custom macro
	6	UO314	Output signal for custom macro
	7	UO315	Output signal for custom macro
F62	0	UO316	Output signal for custom macro
	1	UO317	Output signal for custom macro
	2	UO318	Output signal for custom macro
	3	UO319	Output signal for custom macro
	4	UO320	Output signal for custom macro
	5	UO321	Output signal for custom macro
	6	UO322	Output signal for custom macro
	7	UO323	Output signal for custom macro
F63	0	UO324	Output signal for custom macro
	1	UO325	Output signal for custom macro
	2	UO326	Output signal for custom macro
	3	UO327	Output signal for custom macro
	4	UO328	Output signal for custom macro
	5	UO329	Output signal for custom macro
	6	UO330	Output signal for custom macro
	7	UO331	Output signal for custom macro
F64	0	ZP1	Signal of completing return to the reference point
	1	ZP21	Signal of completing return to the 2nd reference point
	2	MV1	Signal during axis travel
	3	MD1	Travel direction signal
	4	ZP31	Signal of completing return to the 3rd reference point
	5	ZP41	Signal of completing return to the 4th reference point
	6	INP1	Inposition signal
	7	*ENB1	Validation signal for servo off
F65	0	MMI1	Validation signal for mirror image
	1		
	2		
	3		
	4		
	5		
	6		
	7	RPRF1	Signal of completing return to the reference point

ADDRESS	BIT	SIGNAL	DESCRIPTION
F66	0		
	1		
	2	EIAL1	Alarm signal
	3		
	4		
	5	EOTP1	Signal for over travel plus direction
	6	EOTN1	Signal for over travel minus direction
	7	EBSY1	Import signal of instructing axis control
F68	0	ZP2	Signal of completing return to the reference point
	1	ZP22	Signal of completing return to the 2nd reference point
	2	MV2	Signal during axis travel
	3	MD2	Travel direction signal
	4	ZP32	Signal of completing return to the 3rd reference point
	5	ZP42	Signal of completing return to the 4th reference point
	6	INP2	Inposition signal
	7	*ENB2	Validation signal for servo off
F69	0	MMI2	Validation signal for mirror image
	1		
	2		
	3		
	4		
	5		
	6		
	7	RPRF2	Signal of completing return to the reference point
F70	0		
	1		
	2	EIAL2	Alarm signal
	3		
	4		
	5	EOTP2	Signal for over travel plus direction
	6	EOTN2	Signal for over travel minus direction
	7	EBSY2	Import signal of instructing axis control

Same as F64~F67 (1st axis) and F68~F71 (2nd axis) to the rest.
(F72~F75) 3rd axis, (F76~F79) 4th axis, (F80~F83) 5th axis, (F84~F87) 6th axis
(F88~F91) 7th axis, (F92~F95) 8th axis, (F96~F99) 9th axis, (F100~F103) 10th axis
(F104~F107) 11th axis, (F108~F111) 12th axis, (F112~F115) 13th axis,
(F116~F119) 14th axis (F120~F123) 15th axis, (F124~F127) 16th axis

ADDRESS	BIT	SIGNAL	DESCRIPTION
F128	0		
	1		
	2		
	3		
	4	ORAR3	Orient completion signal
	5	*SPAL3	Spindle trouble signal
	6	SST3	Zero speed signal
	7	SARM3	Signal for indicating access to a designated speed
F129	0		
	1		
	2		
	3		
	4	ORAR4	Orient completion signal
	5	*SPAL4	Spindle trouble signal
	6	SST4	Zero speed signal
	7	SARM4	Signal for indicating access to a designated speed
F130	0	ANLG10	Analog data input signal
	1	ANLG11	Analog data input signal
	2	ANLG12	Analog data input signal
	3	ANLG13	Analog data input signal
	4	ANLG14	Analog data input signal
	5	ANLG15	Analog data input signal
	6	ANLG16	Analog data input signal
	7	ANLG17	Analog data input signal
F131	0	ANLG18	Analog data input signal
	1	ANLG19	Analog data input signal
	2	ANLG1A	Analog data input signal
	3	ANLG1B	Analog data input signal
	4		
	5		
	6		
	7		

F132.0 ~ F133.3 (ALNG20~2B CHANNEL2)
F134.0 ~ F135.3 (ALNG30~3B CHANNEL3)
F136.0 ~ F137.3 (ALNG40~4B CHANNEL4)
F138.0 ~ F139.3 (ALNG50~5B CHANNEL5)
F140.0 ~ F141.3 (ALNG60~6B CHANNEL6)
F142.0 ~ F143.3 (ALNG70~7B CHANNEL7)
F144.0 ~ F145.3 (ALNG80~8B CHANNEL8)

ADDRESS	BIT	SIGNAL	DESCRIPTION
F146	0	JGFN01	Completion of 1st axis movement through rapid feed of the jog designated by value of machine coordinates
	1	JGFN02	Completion of 2nd axis movement through rapid feed of the jog designated by value of machine coordinates
	2	JGFN03	Completion of 3rd axis movement through rapid feed of the jog designated by value of machine coordinates
	3	JGFN04	Completion of 4th axis movement through rapid feed of the jog designated by value of machine coordinates
	4	JGFN05	Completion of 5th axis movement through rapid feed of the jog designated by value of machine coordinates
	5	JGFN06	Completion of 6th axis movement through rapid feed of the jog designated by value of machine coordinates
	6	JGFN07	Completion of 7th axis movement through rapid feed of the jog designated by value of machine coordinates
	7	JGFN08	Completion of 8th axis movement through rapid feed of the jog designated by value of machine coordinates
F147	0	JGFN09	Completion of 9th axis movement through rapid feed of the jog designated by value of machine coordinates
	1	JGFN10	Completion of 10th axis movement through rapid feed of the jog designated by value of machine coordinates
	2	JGFN11	Completion of 11th axis movement through rapid feed of the jog designated by value of machine coordinates
	3	JGFN12	Completion of 12th axis movement through rapid feed of the jog designated by value of machine coordinates
	4	JGFN13	Completion of 13th axis movement through rapid feed of the jog designated by value of machine coordinates
	5	JGFN14	Completion of 14th axis movement through rapid feed of the jog designated by value of machine coordinates
	6	JGFN15	Completion of 15th axis movement through rapid feed of the jog designated by value of machine coordinates
	7	JGFN16	Completion of 16th axis movement through rapid feed of the jog designated by value of machine coordinates
F148	0	PT_A1	Currently indicated working setup number in automatic system mode
	1	PT_A2	Currently indicated working setup number in automatic system mode
	2	PT_A3	Currently indicated working setup number in automatic system mode
	3	PT_A4	Currently indicated working setup number in automatic system mode
	4	PT_A5	Currently indicated working setup number in automatic system mode
	5	PT_A6	Currently indicated working setup number in automatic system mode
	6	PT_A7	Currently indicated working setup number in automatic system mode
	7	PT_A8	Currently indicated working setup number in automatic system mode
F149	0	PT_M1	Currently indicated working setup number in manual system mode
	1	PT_M2	Currently indicated working setup number in manual system mode
	2	PT_M3	Currently indicated working setup number in manual system mode
	3	PT_M4	Currently indicated working setup number in manual system mode
	4	PT_M5	Currently indicated working setup number in manual system mode
	5	PT_M6	Currently indicated working setup number in manual system mode
	6	PT_M7	Currently indicated working setup number in manual system mode
	7	PT_M8	Currently indicated working setup number in manual system mode
F150	0	KEYF01	Validation of F1 key input
	1	KEYF02	Validation of F2 key input
	2	KEYF03	Validation of F3 key input
	3	KEYF04	Validation of F4 key input
	4	KEYF05	Validation of F5 key input
	5	KEYF06	Validation of F6 key input
	6	KEYF07	Validation of F7 key input
	7	KEYF08	Validation of F8 key input

ADDRESS	BIT	SIGNAL	DESCRIPTION
F151	0	KEYF09	Validation of F9 key input
	1	KEYF10	Validation of F10 key input
	2	KEYF11	Validation of F11 key input
	3	KEYF12	Validation of F12 key input
	4		
	5		
	6		
	7	PDATLD	Validation signal for data load
F152	0		
	1	RPRV	Origin reverse PB on
	2	RXYCHG	X and Y axes replacement PB on
	3	RMIRY	Request PB on for mirror image of Y axis
	4	RMIRX	Request PB on for mirror image of X axis
	5	RPHCAN	Request PB on for canceling preheating
	6	RPRHT	Request PB on for extending preheating
	7		

ADDRESS	BIT	SIGNAL	DESCRIPTION
X0~X4 X114	0~7		Machine → PLC input signal of the DIO3 board No. 1 made by the user
X300 ~ X305	0~7		Machine → PLC input signal of the DIO3 board No. 2 made by the user
X306 ~ X311	0~7		Machine → PLC input signal of the DIO3 board No. 3 made by the user
X400 ~ X403	0~7		Machine → PLC input signal of the RIO2 board No. 1 made by the user
X404 ~ X407	0~7		Machine → PLC input signal of the RIO2 board No. 2 made by the user
X408 ~ X411	0~7		Machine → PLC input signal of the RIO2 board No. 3 made by the user
X413 ~ X416	0~7		Machine → PLC input signal of the RIO2 board No. 4 made by the user
X417 ~ X420	0~7		Machine → PLC input signal of the RIO2 board No. 5 made by the user
X421 ~ X424	0~7		Machine → PLC input signal of the RIO2 board No. 6 made by the user
X425 ~ X428	0~7		Machine → PLC input signal of the RIO2 board No. 7 made by the user
X429 ~ X432	0~7		Machine → PLC input signal of the RIO2 board No. 8 made by the user
X100 ~ X107	0~7		Operation panel → PLC input signal of the RIO1 board No. 1 made by the user
X108 ~ X113 X200 ~ X201	0~7		Operation panel → PLC input signal of the RIO1 board No. 2 made by the user

ADDRESS	BIT	SIGNAL	DESCRIPTION
Y0~Y4 Y412	0~7		Machine → PLC output signal of the DIO3 board No. 1 made by the user
Y300 ~ Y305	0~7		Machine → PLC output signal of the DIO3 board No. 2 made by the user
Y306 ~ Y311	0~7		Machine → PLC output signal of the DIO3 board No. 3 made by the user
Y400 ~ Y403	0~7		Machine → PLC output signal of the RIO2 board No. 1 made by the user
Y404 ~ Y407	0~7		Machine → PLC output signal of the RIO2 board No. 2 made by the user
Y408 ~ Y411	0~7		Machine → PLC output signal of the RIO2 board No. 3 made by the user
Y413 ~ Y416	0~7		Machine → PLC output signal of the RIO2 board No. 4 made by the user
Y417 ~ Y420	0~7		Machine → PLC output signal of the RIO2 board No. 5 made by the user
Y421 ~ Y424	0~7		Machine → PLC output signal of the RIO2 board No. 6 made by the user
Y425 ~ Y428	0~7		Machine → PLC output signal of the RIO2 board No. 7 made by the user
Y429 ~ Y432	0~7		Machine → PLC output signal of the RIO2 board No. 8 made by the user
Y100 ~ Y107	0~7		Operator's panel → PLC output signal of the RIO1 board No. 1 made by the user
Y108 ~ Y112 Y200 ~ Y202	0~7		Operator's panel → PLC output signal of the RIO1 board No. 2 made by the user

ADDRESS	BIT	SIGNAL	DESCRIPTION
R0 ~ R519	0 ~ 7		Internal relay (Read only data for R500~R519)
A0 ~ A24	0 ~ 7		Each point = 0 : Request for eliminating message 1 : Request for displaying message Each point (bit) becomes a flag to request for displaying a corresponding message. One message can be up to 128 characters.
K0 ~ K15	0 ~ 7		Keep relay
C0 ~ C79	0 ~ 7		Ring counter Count range: 0 ~ 32767 One counter occupies 4 bytes (2 bytes: preset value, 2 bytes: accumulated value). Assign counter numbers (1~20) for sequence programming.
D0 ~ D511	0 ~ 7		Data table
Data without address	0 ~ 7		Variable timer 1 sec. long timer (No.1 ~ 8) (Range: 1 sec. ~ 32767 sec.) 10 msec. short timer (No.9 ~ 40) (Range: 10 msec. ~ 32767 msec.)
Data without address	0 ~ 7		Fixed timer (up to 100) (Range: 10 msec. ~ 327.67 sec.)

2.2 PLC Signal List 2 (in the order of functions)

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
1	Preliminary functions	SMPON (F07.2) MA (F00.7) SA (F00.6)		Servo main power on All control units set. Servo setting finished.
2	Reset Emergency stop Emergency L/S	 *ESPM (F02.2) *RST (F00.2) EMGLS (F07.0)	ERS(G00.7) *ESP (G00.4) RRW (G00.6)	Request for external reset Emergency at the NC side Request for emergency stop Request for reset & rewind Status of reset key Status of EMG. L/S on
3	Interlock		*IT (G00.0) *AIT (G01.0) *CSL (G00.1) *BSL (G01.1) *IT1 (G64.4) *IT2 (G74.4) *IT3 (G84.4)	(Automatic/Manual) request for interlocking all axes (Automatic) request for interlocking all axes Cutting block start interlock Block start interlock Interlocking the 1st axis Interlocking the 2nd axis Interlocking the 3rd axis
4	Servo off	 *ENB1 (F64.7) *ENB2 (F68.7) *ENB (F72.7)	*SVF1 (G64.6) *SVF2 (G74.6) *SVF3 (G84.6)	Request for servo off of the 1st axis Servo off of the 2nd axis Servo off of the 3rd axis Notification of the state of the 1st axis servo off Notification of the state of the 2nd axis servo off Notification of the state of the 3rd axis servo off
5	Over travel (Hard)		*-L1 (G64.1) *+L1 (G64.0) *-L2 (G74.1) *+L2 (G74.0) *-L3 (G84.1) *+L3 (G84.0)	1st axis-over travel 1st axis+over travel 2nd axis-over travel 2nd axis+over travel 3rd axis-over travel 3rd axis+over travel
6	Automatic start Feed/hold Automatic operation condition	DST (F01.2) DSP (F02.3) OP (F00.5) STL (F00.4) SPL (F00.3)	 ST (G05.0) *SP (G00.5)	Input of DKU automatic start key Request for starting automatic operation Request for stopping automatic operation Input of DKU feed hold key Indication under automatic operation Indication under starting automatic operation Indication under stopping automatic operation
7	Alarm	AL (F00.1) PSALM (F06.0) SVALM (F06.1) OHALM (F06.2) OTALM (F06.3) SYALM (F06.4)		Under alarm generation Under program alarm generation Servo alarm Over heat alarm over travel alarm System alarm

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
8	Auxiliary functions	M00~M31 (F16.0~F19.7)		M code output (4 bytes)
		MF (F08.0)		M flag strobe signal
	Spindle functions	S00~S31 (F20.0~F23.7)		S code output (4 bytes)
		SF (F08.1)		S flag strobe signal
	Tool functions	T00~T31 (F24.0~F27.7)		T code output (4 bytes)
		TF (F08.2)		T flag strobe signal
	Secondary auxiliary functions	B00~B31 (F28.0~F31.7)		B code output (4 bytes)
		BF (F08.3)		B flag strobe signal
	Distribution completed	DEN (F01.0)		Distribution completed and inposition
		IPEN (F01.1)		Distribution completed
	Completion signal		FIN (G05.1)	M, S, T, and B codes completion signal
	Decode M signal	DM00 (F09.4)		M00 execution
		DM01 (F09.5)		M01 execution
		DM02 (F09.6)		M02 execution
		DM30 (F09.7)		M30 execution
9	Spindle control (for the first spindle)	RO00~RO15 (F10.0~F11.7)		Instructed number of spindle revolutions (2 bytes)
		AR00~AR15 (F12.0~F13.7)		Actual number of spindle revolutions (2 bytes from position coder)
		MR00~MR15 (F14.0~15.7)		Number of clamp revolutions (2 bytes)
		MSOC (F06.6)		Spindle override cancel
		SOR0~7 (F40)		Spindle override 50%~150%
		SARM1 (F44.7)		Access signal to spindle speed
		SST1 (F44.6)		0 speed signal
		*SPAL1 (F44.5)		Spindle trouble
		ORAR1 (F44.4)		Orientation completed
			SCMP (G06.0)	Spindle clamped
			SOVR0~7 (G18)	Spindle override input
			RIGN1 (G25.7)	0 instruction voltage +
			RI100~RI111 (G24.0~G25.3)	Instruction voltage Instruction (12 bits)
			ALMR1 (G42.5)	Alarm reset
			RDY1 (G42.4)	Ready for spindle
			ORCM1 (G43.7)	Orientation instruction
			CRSFR1 (G43.6)	Forward rotation of spindle
			CRSRV1 (G43.5)	Reverse rotation of spindle
			*ESP1 (G43.4)	Emergency stop of spindle

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
9	Rigid tapping	RTAP(F07.3)		Notification of instruction for rigid tapping mode
			RGTMD1 (G42.2)	Signal for rigid mode selection ready
			HSP1 (G43.1)	High speed tapping mode
	Decision function for spindle position		SPSTP(G26.0)	Validation signal for spindle stop
		SUCLP(F47.1)		Signal requesting for unclampping spindle
			*SEUCL(G26.2)	Completion signal for unclampping spindle
		SCLP(F47.2)		Signal requesting for clampping spindle
			*SECLP(G26.3)	Completion signal for clampping spindle
10	Soft operator Panel input signal	PB8~15 (F42) PB0~7 (F43) PB16~23 (F45)		Switch input signal for operator's panel
	Program screen Key	RMLK(F46.7)		Machine lock S/W input signal
		ROVC(F46.6)		Override cancel S/W
		RABS(F46.5)		Manual absolute S/W
		RM01(F46.4)		M01 S/W
		RSBK(F46.3)		Single block S/W
		RBDT1(F46.2)		Optional block skip S/W
		RDRN(F46.1)		Dry run S/W
		RAFL(46.0)		Aux. function lock S/W
		RCLMA(F47.0)		Coolant manual S/W
		RCLCA(F47.7)		Coolant cancel S/W
		RCHIP(47.5)		Chip conveyor S/W
	Soft operator Panel S/W state		RPB8~15 (G40) RPB0~7 (G41) RPB16~23 (G44)	Request for displaying the status of operator's panel S/W
	Memory protection		KEY1(G05.4)	Request for memory protection
			KEY2(G05.5)	Request for memory protection
			KEY3(G05.6)	Request for memory protection
			KEY4(G05.7)	Request for memory protection
		MKEY(F06.7)		Memory protection status

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
11	Automatic operation test		AFL(G04.0)	Request for auxiliary function lock
		MAFL(F04.0)		State of auxiliary function lock
			DRN(G04.1)	Request for dry run
		MDRN(F04.1)		State of dry run
			BDTI(G04.2)	Request for optional block skip
		MBDT1(F04.2)		State of optional block skip
			SBK(G04.3)	Request for single block
		MSBK(F04.3)		State of single block
			OVC(G04.4)	Request for override cancel
			M01(G06.1)	Request for M01 selection
		MM01(F04.4)		State of M01 selection
			ABS(G04.5)	Request for manual absolute
		MABS(F04.5)		State of manual absolute
			MLK(G04.7)	Request for machine lock
			MLK1 (G65.3)	Machine lock for the 1st axis
			MLK2 (G75.3)	Machine lock for the 2nd axis
			MLK3 (G85.3)	Machine lock for the 3rd axis
		MMLK(F04.7)		State of machine lock
		EDTCHK(F07.1)		Signal under checking operation in edit mode
12	Program status	CSS(F01.7)		Under control of constant driving speed
		THRD(F01.6)		Screw tapping
		RPD(F01.5)		Rapid feeding
		TAP(F01.4)		Tapping
		INCH(F01.3)		In inch input mode
		CUT(F02.1)		Under cutting feed
13	Axis travel status	MV1(F64.2)		Moving the 1st axis
		MV2(F68.2)		Moving the 2nd axis
		MV3(F72.2)		Moving the 3rd axis
	Axis travel direction	MD1(F64.3)		1st axis – direction being moved
		MD2(F68.3)		2nd axis – direction being moved
		MD3(F72.3)		3rd axis – direction being moved
	Inposition	INP1(F64.6)		1st axis is in inposition.
		INP2(F68.6)		2nd axis is in inposition.
		INP3(F72.6)		3rd axis is in inposition.
14	Mode selection		ZRN(G03.0)	Request for selecting ref. point return
		MZRN(F03.0)		Ref. point return being selected
			H(G03.1)	Request for selecting MPG feed
		MH(F03.1)		MPG feed being selected
			J(G03.2)	Request for selecting jog feed
		MJ(F03.2)		Jog feed being selected
			D(G03.3)	Request for selecting MDI operation
		MD(F03.3)		MDI operation being selected
			T(G03.4)	Request for selecting tape operation
		MT(F03.4)		Tape operation being selected
			MEM(G03.5)	Request for selecting memory operation
		MMEM(F03.5)		Memory operation being selected
			EDT(G03.6)	Request for selecting edit mode
		MEDT(F03.6)		Edit mode being selected

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
15	Reference point return	MZRN(F03.0)	ZRN(G03.0)	Request for selecting ref. point return mode Ref. point return mode
	Direction of moving axis		+J1(G65.0) -J1(G65.1) +J2(G75.0) -J2(G75.1) +J3(G85.0) -J3(G85.1)	+ direction origin of the 1st axis - direction + direction origin of the 2nd axis - direction + direction origin of the 3rd axis - direction
	Speed selection		ROV2(G06.6) ROV1(G06.5)	0 0 RT0 0 1 RT1 1 0 RT2
	Return completed	ZP1(F64.0)		Completing ref. point return of the 1st axis
		ZP21(F64.1)		Completion of the 2nd ref. point return
		ZP31(F64.4)		Completion of the 3rd ref. point return
		ZP41(F64.5)		Completion of the 4th ref. point return
		ZP2(F68.0)		Completing ref. point return of the 1st axis
		ZP22(F68.1)		Completion of the 2nd ref. point return
		ZP32(F68.4)		Completion of the 3rd ref. point return
		ZP42(F68.5)		Completion of the 4th ref. point return
		ZP3(F72.0)		Completing ref. point return of the 3rd axis
		ZP23(F72.1)		Completion of the 2nd ref. point return
		ZP33(F72.4)		Completion of the 3rd ref. point return
		ZP43(F72.5)		Completion of the 4th ref. point return
	Deceleration DOG input	*DEC1(X00.0)		Deceleration signal of the 1st axis
		*DEC2(X00.2)		Deceleration signal of the 2nd axis
		*DEC3(X00.4)		Deceleration signal of the 3rd axis
		*DEC4(X00.6)		Deceleration signal of the 4th axis
		*DEC5(X01.0)		Deceleration signal of the 5th axis
		*DEC6(X01.2)		Deceleration signal of the 6th axis
	Signal for automatic ref. point return		ADEC1(G65.4)	Signal for automatic ref. point return of the 1st axis
			ADEC2(G75.4)	Signal for automatic ref. point return of the 2nd axis
			ADEC3(G85.4)	Signal for automatic ref. point return of the 3rd axis
16	MPG feed	MH(F03.1)	H(G03.1)	Request for selecting MPG feed MPG feed being selected
	Feed axis		HS1A~D(G11.0~3) HS1A~D(G11.4~7) HS3A~D(G10.0~3)	Selection of MPG1 feed axis Selection of MPG2 feed axis Selection of MPG3 feed axis
	Amount of movement		MP2(GO6.3) MP1(G06.2)	0 0 LIIx1 0 1 LIIx10 1 0 LIIx100 (LII= Least input increment)

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
17	Manual continuous feed	MJ(F03.2)	J(G03.2)	Request for selecting jog feed Jog feed being selected
	Feed axis		+J1(G65.0)	Request for feeding the 1st axis to the + direction
			-J1(G65.1)	- direction
			+J2(G75.0)	Request for feeding the 2nd axis to the + direction
			-J2(G75.1)	- direction
	Speed selection		*JV0~7 (G15)	Jog speed selection
	Selection of rapid feed Feed rate		RT(G06.7) ROV2(G06.6) ROV1(G06.5)	Request for selecting rapid feed 0 RT0 0 RT1 1 RT2 0 1 0
18	Feed override		*FV0~7(G12)	Feed override %
		MFOC(F06.5)		Request for cancelling feed override
			OVC(G04.4)	Override 100%
		ROVC(F46.6)		Validation of cancelling feed override
19	Skip function		SKIP1(G00.3)	Request for skip 1
			SKIP2(G01.5)	Request for skip 2
			SKIP3(G01.6)	Request for skip 3
			SKIP4(G01.7)	Request for skip 4
20	External input/ output		EXRD(G32.1)	Signal requesting for starting external read
			EXPUN(G32.0)	Signal requesting for starting external punch
			EXSTP(G32.2)	Signal requesting for stopping external read/punch
		RPBSY(F07.4)		Singal during external read/punch
	External work number Search		WN1~128 (G19)	Search for external work number
	External data input		EIA0~7 (G33)	Address signal for external data input
			EID0~47 (G34~G39)	Data signal for external data input
			EISTB(G32.7)	Strobe signal for external data input
		EIREND(F32.5)		Read completion signal for external data input
		ESEND(F07.5)		Completion signal for external search
	External data output	EOA0~7 (F33)		Address signal for external data output
		EOD0~47 (F34~F39)		Data signal for external data output
			ERDRQ(G32.6)	Signal requesting for external data output
		EOSTB(F32.7)		Strobe signal for external data output
			EOREND(G32.5)	Read completion signal for external data output
21	Custom macro I/F for input signal		UI000~031 (G48~G51)	Input signal for custom macro #1032
			UI100~131 (G52~G55)	Input signal for custom macro #1033
			UI200~231 (G56~G59)	Input signal for custom macro #1034
			UI300~331 (G60~G63)	Input signal for custom macro #1035

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
21	I/F for output signal	UO000~031 (F48~F51)		Input signal for custom macro #1132
		UO100~131 (F52~F55)		Input signal for custom macro #1133
		UO200~231 (F56~F59)		Input signal for custom macro #1134
		UO300~331 (F60~F63)		Input signal for custom macro #1135
22	PLC control axis (in the case of the 1st axis)		EOR00~07 (G66)	Cutting rate override
			ECO 0~2 (G67.0~G67.2)	Instruction for axis control
			EIF000~015 (G68~G69)	Cutting feed rate/spindle speed
			ED000~031 (G70~G73)	Axis movement amount/dwell time/spindle direction
			EBUF1(G67.7)	Delivery signal of axis control instruction
		EBSY1(F66.7)		Import signal of axis control instruction
			ECLR1(G67.6)	PLC control axis reset
			ESTP1(G67.5)	Break signal of PLC control axis
			ESBK1(G67.4)	Stop signal of PLC control block
			EMSBK1(G67.3)	Prohibition signal of block stop
		EIAL1(F66.2)		PLC control axis alarm
		EOTP1(F66.5)		+ direction signal of overtravel
		EOTN1(F66.6)		- direction signal of overtravel
			PCAX1(G65.5)	PLC axis control signal
			*SVF1(G64.6)	Servo off signal
		INP1(F64.6)		Inposition signal
		MV1(F64.2)		Signal under axis movement
23	Tool lifecycle management	TLCHA(F07.6)		Signal requesting for replacing tools
		TLCHB(F07.7)		Completion signal for replacing tools
			TLRST(G10.7)	Reset signal for replacing tools
			TLSKP(G09.7)	Tool skip signal
			TL1~64(G9.0~9.6)	Tool group signal
	Measuring value of offset amount Input signal		+MIT1(G65.6)	X-axis + contact surface of measuring value of offset amount
			-MIT1(G65.7)	X-axis - contact surface of measuring value of offset amount
			+MIT2(G75.6)	Z-axis + contact surface of measuring value of offset amount
			-MIT2(G75.7)	Z-axis - contact surface of measuring value of offset amount
	Signal for measuring tool length		TLMI(G08.2)	Signal for selecting a mode to measure tool length
		TLMO(F02.4)		Status signal of the mode to measure tool length
			MRET(G08.3)	Input signal of measuring value
	Tool measurement		AE1~3 (G01.2~G01.4)	Access signal to measuring position

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
24	Chamfering signal		*CHF (G08.0)	Requesting for chamfering override
	Mirror image signal		MI1 (G65.2)	Request for the mirror image of the 1st axis
			MI2 (G75.2)	Request for the mirror image of the 2nd axis
			MI3 (G85.2)	Request for the mirror image of the 3rd axis
		MMI1 (F65.0)		State of the mirror image of the 2nd axis
		MMI2 (F69.0)		State of the mirror image of the 2st axis
		MMI3 (F73.0)		State of the mirror image of the 3rd axis
	Selecting synchronous control		SYNC1~16 (G17,G16)	Selection signal of synchronous control
	Signal under moving rotation axis	ROTMV (F02.5)		State signal under moving rotation axis
25	Handle step feed		HSF00~HSF30 (G224.0~G227.6)	Travel distance of handle feed step (pulse)
			HSFON (G227.7)	Handle feed step in effect
26	Ref. Point return by PLS		ZRN11 (G228.0)	Ref. point return to the 1st origin of the 1st axis
			ZRN12 (G228.1)	Ref. point return to the 2nd origin of the 1st axis
			ZRN13 (G228.2)	Ref. point return to the 3rd origin of the 1st axis
			ZRN14 (G228.3)	Ref. point return to the 4th origin of the 1st axis
			ZRN21 (G228.4)	Ref. point return to the 1st origin of the 2nd axis
			ZRN22 (G228.5)	Ref. point return to the 2nd origin of the 2nd axis
			ZRN23 (G228.6)	Ref. point return to the 3rd origin of the 2nd axis
			ZRN24 (G228.7)	Ref. point return to the 4th origin of the 2nd axis
			ZRN31 (G229.0)	Ref. point return to the 1st origin of the 3rd axis
			ZRN32 (G229.1)	Ref. point return to the 2nd origin of the 3rd axis
			ZRN33 (G229.2)	Ref. point return to the 3rd origin of the 3rd axis
			ZRN34 (G229.3)	Ref. point return to the 4th origin of the 3rd axis
27	Work setting control		PATCR (G236.0)	'Enter' key input
			PATUP (G236.1)	Cursor Up input
			PATDWN (236.2)	Cursor Down input
			ASET (G236.3)	Setting the screen number indicating automatic operation
			MSET (G236.4)	Setting the screen number indicating non-automatic operation
			PT*1~PT*64 (G237.0~G237.6)	Setup data of indicating screen number
		PT_A1~PT_AT8 (F148)		Screen number indicating automatic operation
		PT_M1~PT_M7 (F149)		Screen number indicating non-automatic operation
		PDATLD (F151.7)		Validation signal for data load

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
28	Analog input	ANLG10 ~ANLG1B (F130.0~F131.3)		Analog input data for RAD1 board (Channel 1)
		ANLG20 ~ANLG2B (F132.0~F133.3)		Analog input data for RAD1 board (Channel 2)
		ANLG30 ~ANLG3B (F134.0~F135.3)		Analog input data for RAD1 board (Channel 3)
29	Movement of the axis designating PLC position		JGPS01 (G238.0)	1st axis - Movement of the axis designating the position
			ED000~ED031 (G70.0~G73.7)	Data to designate the 1st axis position
			JGPS02 (G238.1)	2nd axis - Movement of the axis designating the position
			ED100~ED131 (G80.0~G83.7)	Data to designate the 2nd axis position
			JGPS03 (G238.2)	3rd axis - Movement of the axis designating the position
			ED200~ED231 (G90.0~G93.7)	Data to designate the 3rd axis position
		JGFN01 (F146.0)		1st axis - Movement of the axis designating the position completed
		JGFN02 (F146.1)		2nd axis - Movement of the axis designating the position completed
		JGFN03 (F146.2)		3rd axis - Movement of the axis designating the position completed
30	Macro interrupt		UINT (G0.2)	Starting macro interrupt
31	Handle interrupt		HINT1 (G64.5)	Permission of the 1st handle interrupt
			HINT2 (G74.5)	Permission of the 2nd handle interrupt
			HINT3 (G84.5)	Permission of the 3rd handle interrupt
32	Tracing function		TRMOD (G47.0)	Starting tracing function
			NOMCL2 (G47.1)	Setting nominal clearance
			NOMCL3 (G47.2)	Setting nominal clearance
		PRECH (F32.0)		Nominal clearance state
		FAR (F32.1)		Far state
		COLLIS (F32.2)		Collision state
33	Text calculation function		CAL101~CAL116 (G240.0~G241.7)	Executing calculation of text program 1 (O9700)
			CAL201~CAL216 (G242.0~G243.7)	Executing calculation of text program 2 (O9701)
			CAL301~CAL316 (G244.0~G245.7)	Executing calculation of text program 3 (O9702)
			CAL401~CAL416 (G246.0~G247.7)	Executing calculation of text program 4 (O9703)
			CAL501~CAL516 (G248.0~G249.7)	Executing calculation of text program 5 (O9704)
			CAL601~CAL616 (G250.0~G251.7)	Executing calculation of text program 6 (O9705)
			CAL701~CAL716 (G252.0~G253.7)	Executing calculation of text program 7 (O9706)
			CAL801~CAL816 (G254.0~G255.7)	Executing calculation of text program 8 (O9707)

NO	Function	NC → PLC Signal	PLC → NC Signal	Description
34	F key condition	KEYF1 (F150.0)		F1 key on
		KEYF2 (F150.1)		F2 key on
		KEYF3 (F150.2)		F3 key on
		KEYF4 (F150.3)		F4 key on
		KEYF5 (F150.4)		F5 key on
		KEYF6 (F150.6)		F6 key on
		KEYF7 (F150.7)		F7 key on
		KEYF8 (F151.0)		F8 key on
		KEYF9 (F151.1)		Screen key on
		KEYF10 (F151.2)		Select key on
		KEYF11 (F151.3)		Automatic Start key on
		KEYF12 (F151.4)		Automatic Stop key on
35	Gas cutting operation key condition	RPRV (F152.1)		Origin Reverse key on
		RXYCHG (F152.2)		X and Y Axes Replace key on
		RMIRY (F152.3)		Y Axis Mirror Image key on
		RMIRX (F152.4)		X Axis Mirror Image key on
		RPHCAN (F152.5)		Preheating Cancel key on
		RPRHT (F152.6)		Preheating Extend key on

3. PLC Monitoring Function (PLC Timing Chart Function)

3.1 Overview

PLC monitoring function is used to check the state of mechanical I/O signals.

Ladder diagram shows a specific condition to bring a machine or an NC unit to a certain state (alarm generation, feed hold, coolant delivery, magazine rotation, tool clamping, etc.); however, it is usually impossible to know the mechanical I/O signal at the moment that a condition is given. With this function, it is possible to know it.

3.2 How to Start Monitoring Function

Select the 'Diagnosis' screen and 'PLC' in general diagnosis, and press the F8 (finger) key to show the 'MONITOR' menu. Press the menu to start the monitoring function (Fig. 1).

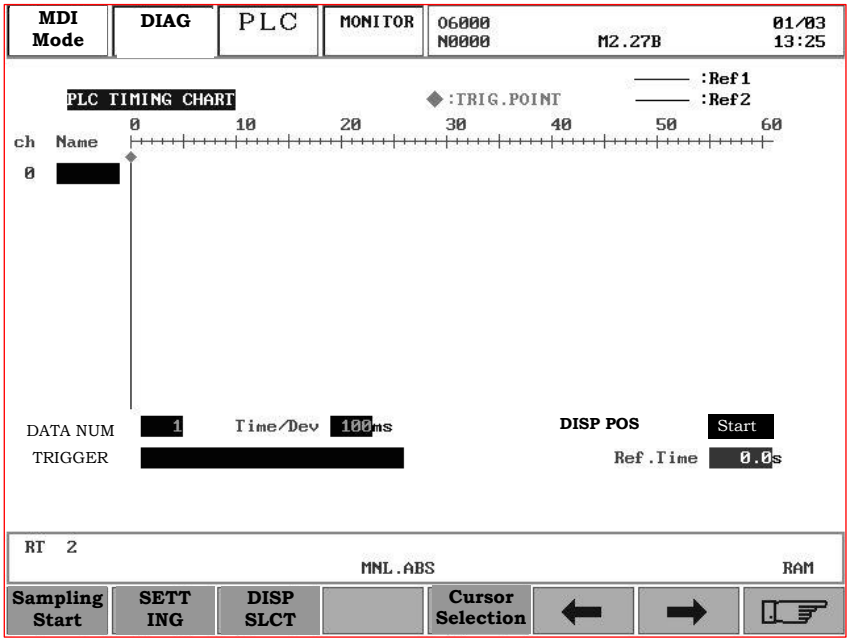


Fig. 1 Time chart screen

Sampling Start ---- When the trigger condition is set, sampling starts.

DISP SLCT ---- Displays the trigger position in such a way to make the position being 0/29/59 of the scale.
Changes the display position.

SETTING ---- The menus to perform various setups of the timing chart appear in the case of the operation modes other than "Ref. Point Return" and "Manual Operation."

DISP SLCT ---- Selects reference cursor.
Selects three options of "None Selected," "Ref 1," and "Ref 2."

⬅ / ➡ ---- Moves to selected cursor position.

☞ ---- Displays other diagnosis menus.

3.3 How to Operate

3.3.1 Condition Setup

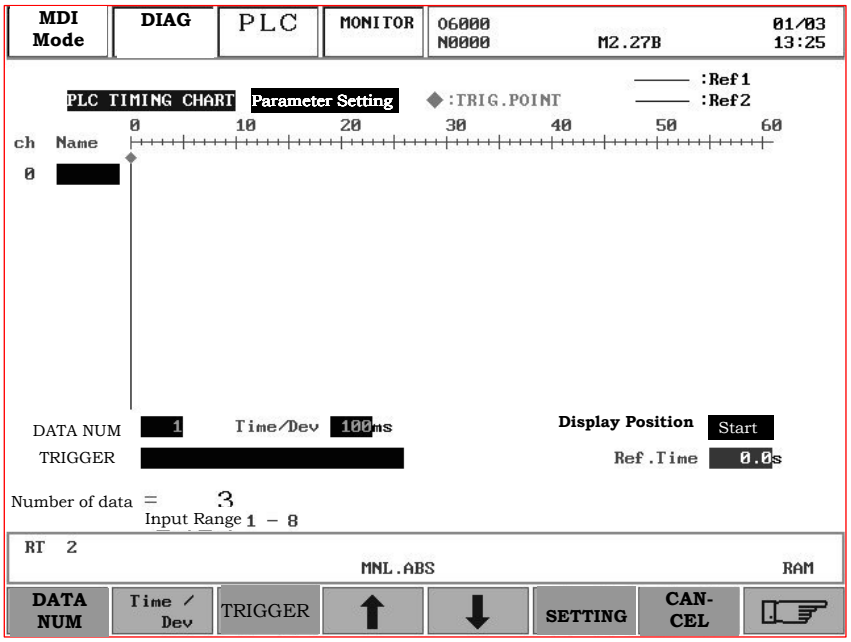


Fig. 2 Condition Setup (Input the number of data)

First, setup any data necessary for the monitoring function such as address confirming the operation, trigger, etc. Pressing the 'Condition Setup' in Fig. 1 will display the menu for data setup (Fig. 2).

1) Press the 'DATA NUM' and input the number of addresses to be checked (1 ~ 8). When inputting '1' ~ '8' and pressing the Enter key, ch name cursors as many as specified are generated (Fig. 3).

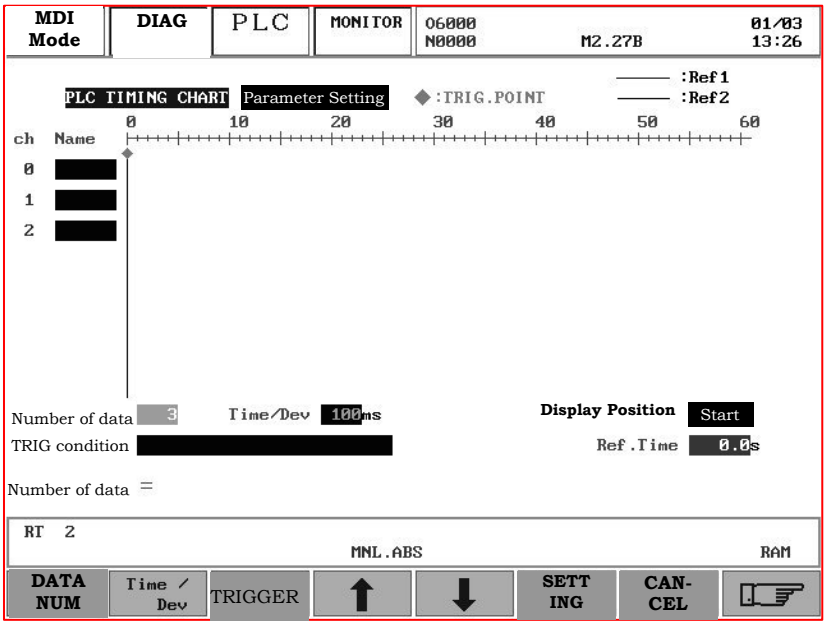


Fig. 3 Screen after entering the number of data

2) Press the 'Time/Dev' menu and enter the unit time (0 ~ 4) .
0 : 10 msec 1 : 50 msec 2 : 100 msec 3 : 500 msec 4 : 1000 msec
Press the Enter key to change the time indication of Time/Dev.

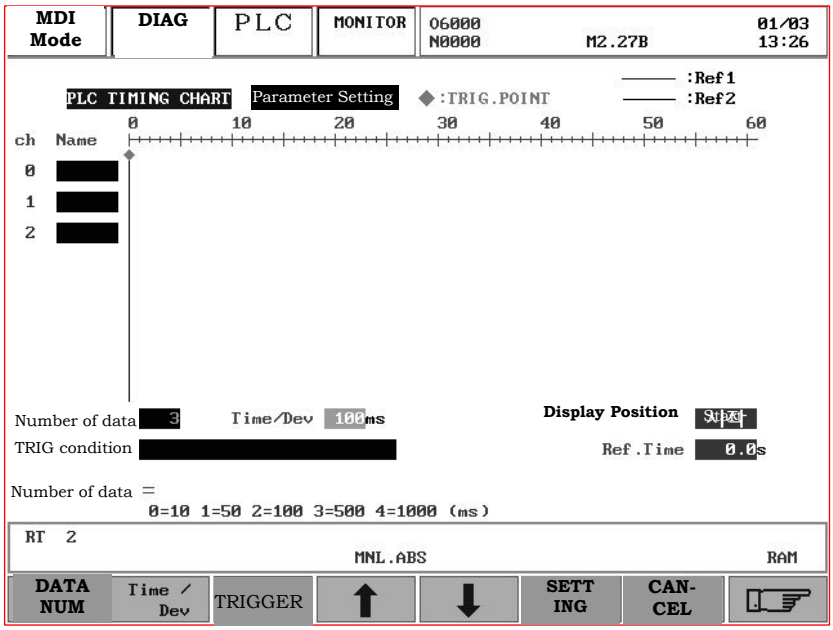


Fig. 4 Time/Dev setup

3) Move the cursor using F4 (up) and F5 (down) keys to setup the addresses to be checked, and enter all of them (Fig. 5).

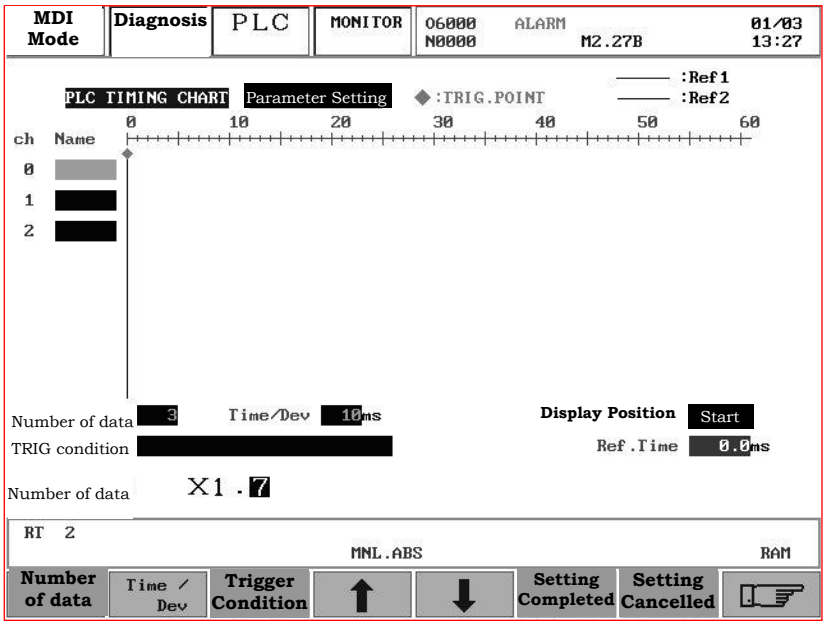


Fig. 5 Address input

4) Press the 'TRIGGER' menu and setup the trigger conditions.
Set the trigger conditions using the ch numbers out of '0' ~ '7', 'D' (Down Edge), 'U' (Up Edge), 'L' (LOW Level), 'H' (High Level), '*' (AND condition), and '+' (OR condition).

e.g.) 0U: Triggers when the ch0 signal is on
0U+1H: Triggers when the ch0 signal is on or the ch1 is on
0U*1L: Triggers when the ch1 is off and the ch0 signal is on

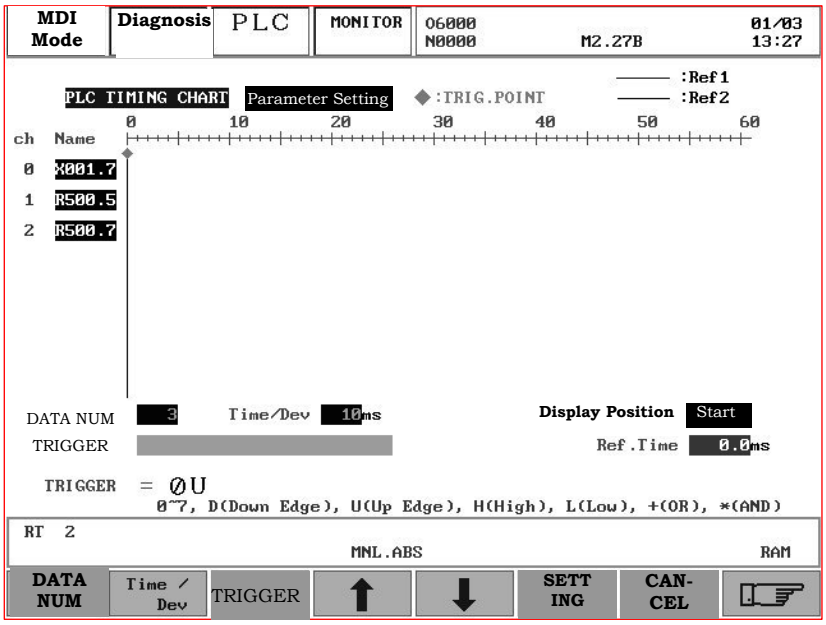


Fig. 6 Input the trigger conditions

5) Memorize the setup data with the 'SETTING' (F6) and cancel the data operated using 'Setup Cancelled' (F7). Then, when pressing the 'Finger' to the previous data, the menu 'INITIAL PARAMETER' appears (Fig. 7). Clear the setup data. The setup data memorized with the 'Setup Completed' (F6) will remain and be continuously used even when turning the power of the SENTROL2 off.

Fig. 7 'INITIAL PARAMETER' menu

3.3.2 Sampling

Pressing the 'SETTING' menu will display all of the conditions as shown in Fig. 8. Pressing the 'Sampling Start' menu will start the sampling operation and change the menu to that as shown in Fig. 9 while 'TRIG' lights up. It goes on until the trigger is realized.

When the trigger is realized, the signal as shown in Fig. 10 will be displayed on the screen.

Press the 'Stop' menu to stop sampling.

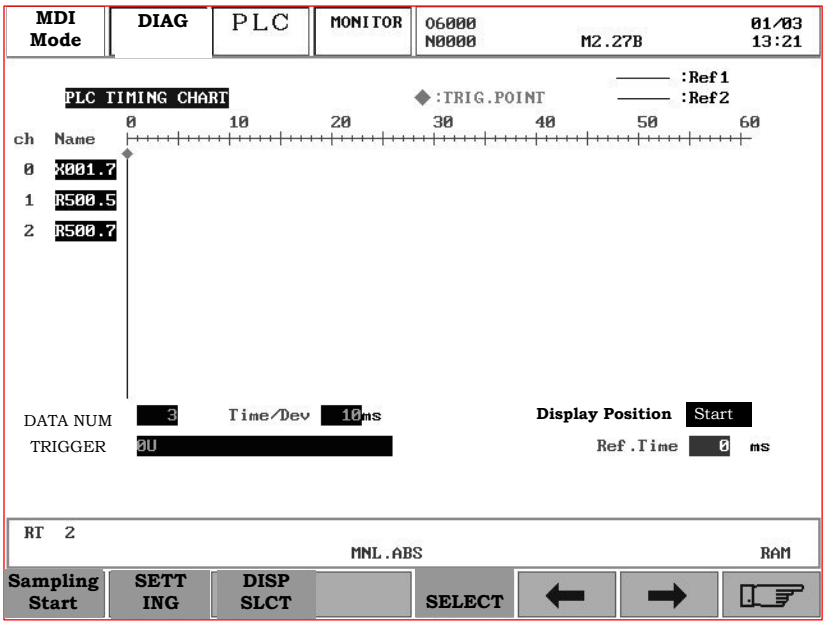


Fig. 8 Sampling start

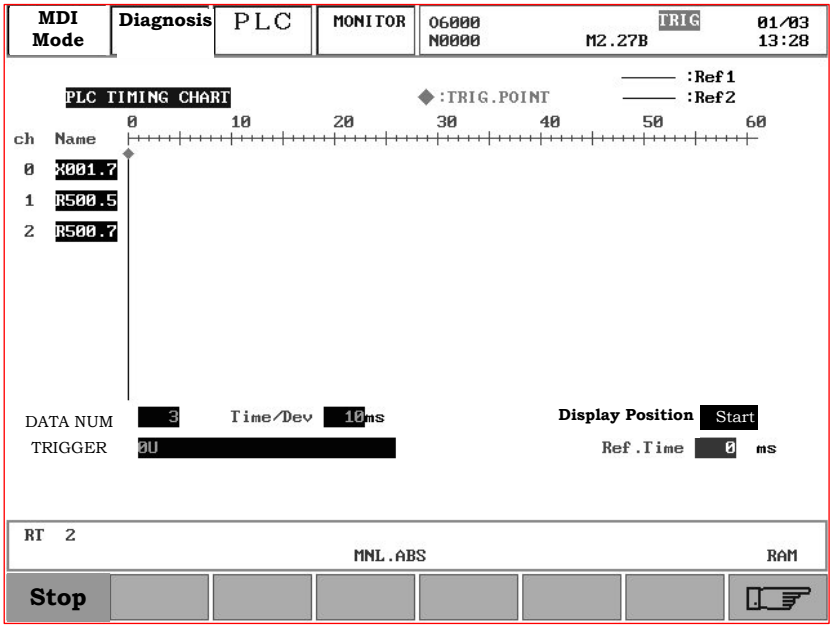


Fig. 9 Sampling being executed

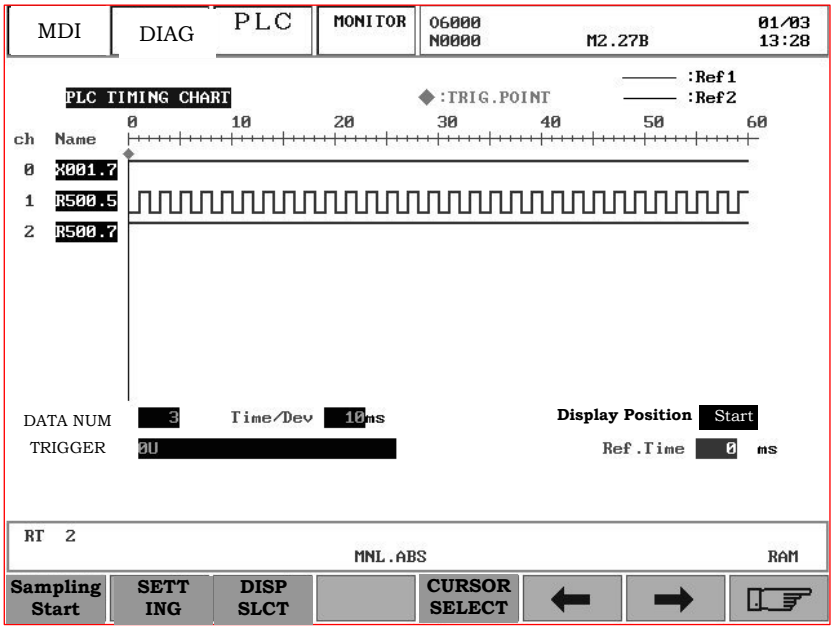


Fig. 10 Start to display the change state of addresses

3.3.3 Display Selection

Pressing the 'Display Selection' menu will change the display positions in the order of the start (Fig. 10), the middle (Fig. 11), and the end (Fig. 12).

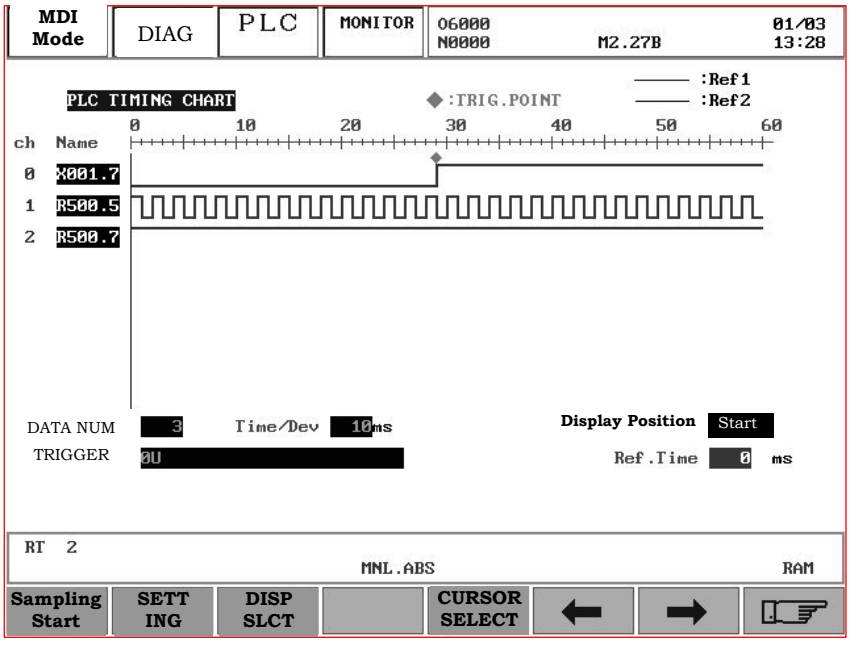


Fig. 11 Display of address change state (middle)

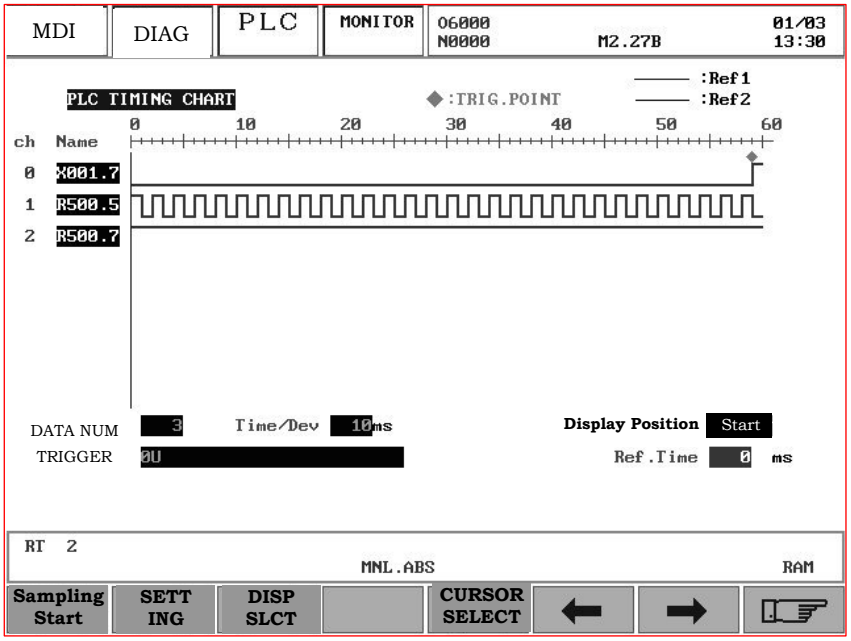


Fig. 12 Display of address change state (end)

3.3.4 Time Measurement

With the 'Cursor Select' menu, it is possible to select the two horizontal straight lines indicating the time and move the lines using the F6 (left) and F7 (right) keys. The time interval of the two lines is displayed on Ref.Time.

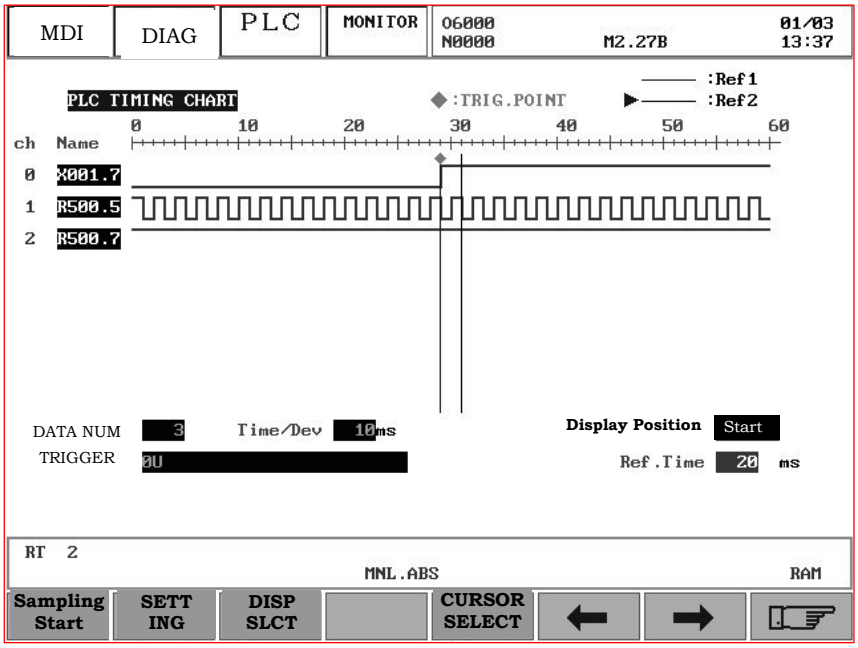


Fig. 13 Time measurement

4. General Diagnosis

	7	6	5	4	3	2	1	0
0000	DEC	TCS	RPI	FED	RAC	FEA	RPF	INP

DEC 0 : Turn on the limit switch for ref. point return.
1 : Turn off the limit switch for ref. point return.

TCS 0 : Touch sensor off
1 : Touch sensor on

RPI 1 : Zero position being stopped

FED 0 : Feed direction ＋
1 : Feed direction －

RAC 1 : Being in ref. point return

REA 1 : Feed active

RPF 1 : Ref. point return completed

INP 1 : Inposition state

0001	MACHINE POSITION

Position of machine coordinates

Unit: Output unit

0002	POSITION ERROR [pulse]

Position variation

Unit: Input unit

0003	COMPENSATION [machine]

Amount of compensation

Unit: Input unit

0004	ENCODER COUNTER [pulse]

Value of the feedback counter for encoder

Unit: Detection unit

0005	ENCODER CTR SKIP [pulse]

Value of encoder feedback counter latched to skip signal or ENZ

Unit: Detection unit

	7	6	5	4	3	2	1	0
0006					ENT	ENZ	ENB	ENA

ENT : Encoder touch sensor 1 : ON

ENZ : Encoder zero signal 1 : ON

ENB : Encoder B phase signal

ENA : Encoder A phase signal

	7	6	5	4	3	2	1	0
0007							EBL	PRD

EBL 1 : Enable on
0 : Enable off

PRD 1 : Power ready on
0 : Power ready off

0008	DA CONVERTER O.P.

DA converter output value

0009	ACTUAL SPEED

Unit: (10mm/min)

0010	DRIFT

Amount of drift compensation

Unit: velo (1velo = 0.31mv)

0011	POSITION LOOP GAIN

Unit: [1/100s]

0012	PULSE COUNTER MISS

Amount of pulse count miss (sign part)

Unit: (PULSE)

0013	ENC 1REV PULSE

Number of pulses generated per one revolution of the encoder (A phase or B phase)

Unit: (PULSE)

0014	SKIP MACHINE POSITION

Machine coordinates when the skip signal is on (unit of internal distribution)

0015	SPINDLE POSITION CODER [pulse]

Value of feedback counter for spindle position coder

Unit: Detection unit

0016	SPINDLE POSITION LOOP GAIN

Unit: [1/100s]

0017	SPINDLE POSITION ERROR [pulse]

Position variation of spindle

Unit: Input unit

	7	6	5	4	3	2	1	0
0018		SKP	MPB	MPA				

SKP : 0 : Skip signal in

MPB : Phase signal of manual pulse generator B

MPA : Phase signal of manual pulse generator A

	7	6	5	4	3	2	1	0
0019		THS	BAT	12D	24D	EMG	ELS	

THS : 0 : When the internal temperature sensor of the main unit indicates 70℃ or higher

BAT : 0 : When the battery voltage of the backup memory is 2.6V or lower

12D : 0 : When ±12V within the main unit is less than ±10V due to short circuit, etc.

4D : 0 : When ±24V within the main unit is less than 20V due to short circuit, etc.

EMG : 0 : While pressing down the emergency stop switch

ELS : 0 : When the emergency limit switch is on

	7	6	5	4	3	2	1	0
0020						PCZ	PCB	PCA

PCZ : 1 : Spindle position coder zero signal is on.

PCB : 1 : Phase signal of the spindle position coder B is on.

PCA : 1 : Phase signal of the spindle position coder A is on.

0021	SYNC POSERR DIFF

각축 SLAVE 축의 MASTER 축과의 위치편차 차이 표시. (2BYTE DATA)

단위 : 검출단위(PULSE)

0022	SYNC POS CORRECTION

동기운전제어에서 동기 맞추기를 위한 보정 전압.
SLAVE 축의 DATA 만 표시된다. (2BYTE DATA)

단위 : 0.305mV

0023	SYNC TORQUE DIFF

각축 SLAVE 축의 MASTER 축과의 TORQUEMONITOR 차이표시.(2BYTE DATA)

단위 : 4.88mV

0024	SYNC SHIFT VALUE

동기운전제어에서 동기 맞추기를 위한 SHIFT 값.
SLAVE 축의 DATA 만 표시된다. (2BYTE DATA)

단위 : 검출단위(PULSE)

0025	SYNC GRID SHIFT DIFF

동기축간의 GRID SHIFT 차이를 표시한다.
PARAMETER 1817 UR6 = 1 일 경우 유효. . (4BYTE DATA)

단위 : 검출단위(PULSE)

Chapter 7 Parameter

1. Parameter Setting

1.1 Parameter setting method

Turn "KEY" on the "OPRT PANL" screen to set the parameters.

The "PARA METR" screen consists of "SETTING" screen (Fig. 7-1) and "SERV PARA" screen (Fig. 7-2).

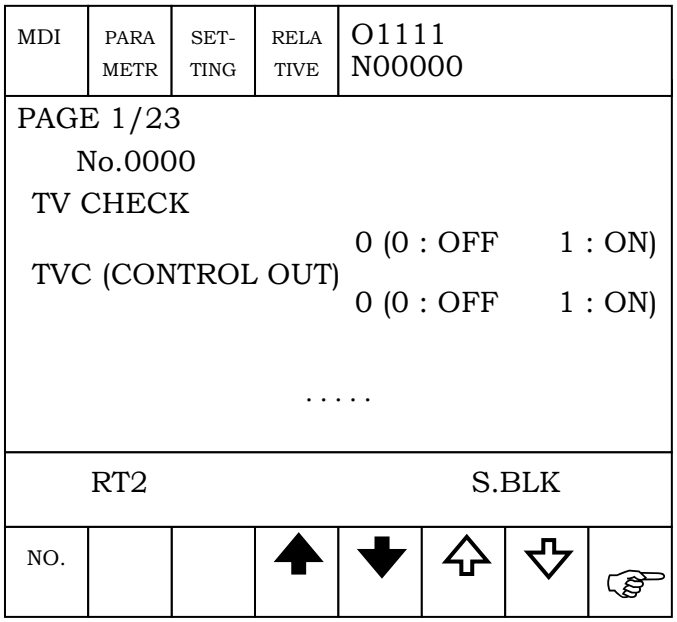


Figure 7-1 (Screen Example)

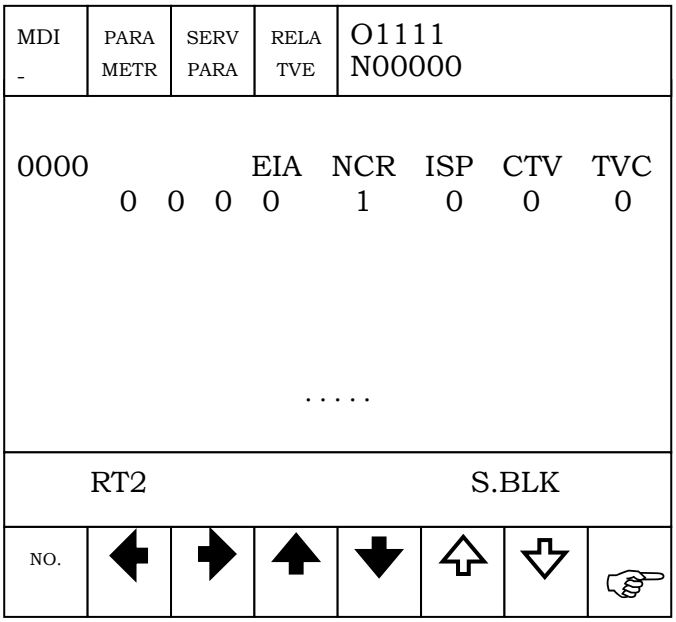


Figure 7-2 (Screen Example)

1) Operational parameter setting method

Turn on the key on the "OPRT PANL" and select "PARAMETR" screen in modes other than zero return and manual operation. If the "SETTING" screen does not appear, press the "KEY" and then "SETTING" key.

F-key functions are as below. Move the cursor onto the parameter to set and enter the set value. The operational parameter is set.

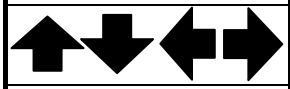
No.	Sets the parameter No.
⬆ ⬇	Moves the cursor up/down.
⇧ ⇩	Moves screen by screen.
☞	Displays the NEXT menu.

2) Service parameter setting method

Turn on the "KEY" on the "OPRT PANL" screen and select the "PARA METR" screen in MDI mode. If the "SERV PARA" screen does not appear, press the "☞" key and then "SERV PARA" key. Using F-key shown below, move the cursor onto the parameter to set and then enter the set value using the number key.

Press "NO." key and enter the parameter number to search the parameter number (Temporary input)

If the wrong number is entered, press [←] Back Space key and enter the number again. To cancel all the numbers that have been temporarily entered, press the "CANCEL" key. Press [↵] Key to set the entered number.

No.	Sets the parameter No.
	Moves the cursor up/down/left/right.
	Moves screen by screen.
☞	Displays the NEXT menu.

Note 1) Each setting parameter has the range available to set the value.

Note 2) "NEXT MENU" mentioned above is as shown below. With this menu, various setting screens can be selected.

SET-TING	MAC RO		SERV PARA	PTCH ERR	IN PUT	OUT PUT	☞

Note 3) Parameters of SENTROL are commonly displayed on the screen for all models regardless of models for lathe or milling. Therefore, In the following "2. Parameter List of SENTROL2" section, each parameter is classified as follows:

1. (L) : Parameter available only for SENTROL2-L (for lathe)
2. (M) : Parameter available only for SENTROL2-M (for milling)
3. No Symbol : Parameter available for entire SENTROL2 models
4. (For Laser Cutter) : Parameter available only for laser cutter
5. (For Laser Scriber) : Parameter available only for laser scriber
   For both laser cutter and laser scriber, parameters of SENTROL-M are used together with such parameters described in 4 and 5.
6. (For Angular grinder) : Parameter available only for angular grinder
   These parameters are used together with the parameters of SENTROL2-L.

3) Pitch error compensation parameter setting method

Turn on the "**KEY**" on the "OPRT PANL" and then select the "PARA METR" screen in MDI mode.
If the "PITCH ERR" screen does not appear, press the "☞" key and then "PITCH ERR".
Using the F-key shown below and move the cursor onto the parameter to set and enter the setting value with the numeric key.
Press the "NO." key and enter the parameter number. This enables to search the parameter number.
(Temporary input)
If the wrong number is entered, press ← Back Space key and enter the number again.
To cancel all the numbers that have been temporarily entered, press the "CANCEL" key. Press ↵ Key to create the entered number.

Setting Range : − 127 ~ 127

No.	Sets the parameter No.
↑ ↓ ← →	Moves the cursor up/down/left/right.
⇧ ⇩	Moves screen by screen.
☞	Displays the NEXT menu.

a) Overview of stored pitch error compensation function
With this function, the pitch error can be compensated for each axis by minimum distance unit. (Note that it is valid only after zero return is performed.) After the zero return, set the tool position as compensation basis. And set the compensation value as parameter in offset interval set for each axis.
(1) Compensatible axis: all axes (rotational axis is also compensatible.)
(2) Compensation point: maximum total of 640 points for all axes
Maximum 256 points per axis.
(3) Compensation range
Per compensation point : − 127 ~ 127
Compensation unit is determined according to diameter or radius setting.

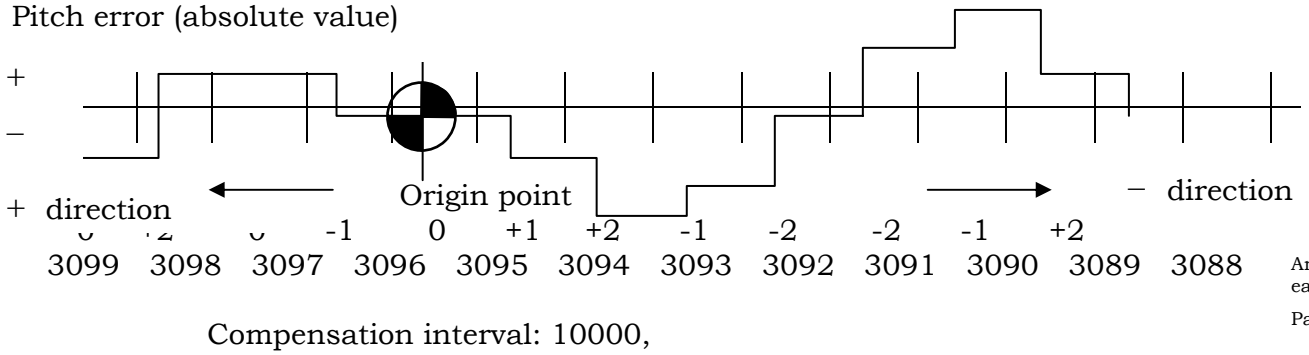
b) Parameter setting
Pitch error parameters are set by the following parameter number.
(1) Pitch error compensation point No. for origin point (each axis) ---------- parameter No. 5420
(2) Pitch error compensation point No. for the most (-) side (each axis) ---- parameter No. 5421
(3) Pitch error compensation point No. for the most (+) side (each axis) ---- parameter No. 5422
(4) Pitch error compensation point interval (each axis) ---------- parameter No. 1813
Pitch error compensation point has the limit for the minimum value, and is determined by the following formula.
Minimum interval value = Maximum speed / 12000 (unit: mm, deg)

Ex.) For the maximum speed of 1200mm/min, the minimum value is 1mm.

(5) Pitch error compensation amount is - set by corresponding to each pitch error compensation point number (parameter No. 3000 ~ 3639).

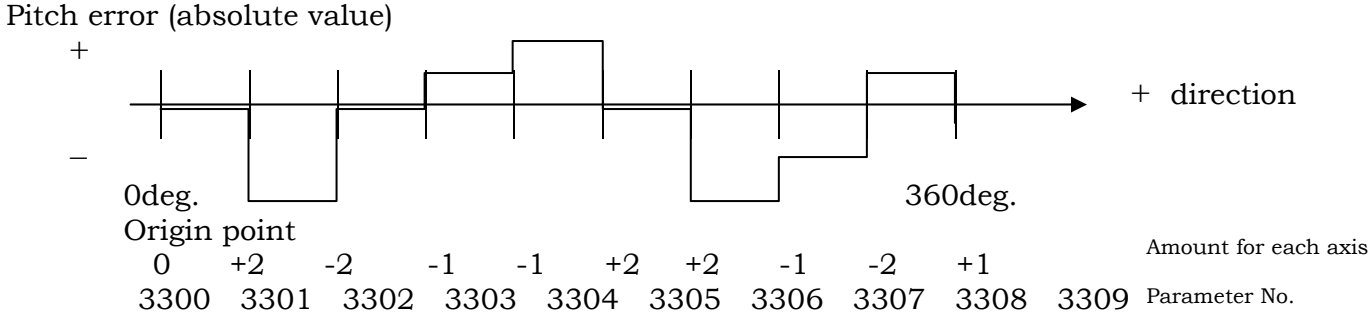
c) Example of parameter setting

(1) Linear axis


Pitch error (absolute value)
+
–
+ direction
Origin point
– direction
0 -1 0 +1 +2 -1 -2 -2 -1 +2
3099 3098 3097 3096 3095 3094 3093 3092 3091 3090 3089 3088
Amount for each axis
Parameter No.

Compensation interval: 10000,
Compensation point: In case of 100, parameter is set as follows:
Pitch error compensation point for origin point NO.5420 = 95
Pitch error compensation point for (-) direction NO.5421 = 0
Pitch error compensation point for (+) direction NO.5422 = 99
Pitch error compensation interval NO.1813 = 10000
For the compensation value, pitch error compensation value (incremental value) between intervals is set.
Note) parameter number should be set to increase in (+) direction.

(2) Rotational axis (parameter 1814REV = 1)
Compensation interval and point should be satisfied with the following conditions.
360000 = compensation interval ×compensation point
Total of compensation amount per 1 rotation should be set to be 0.



Compensation interval: 3600, Compensation point: In case of 10, parameter is set as follows:

Pitch error compensation point for origin point NO.5420 = 300
Pitch error compensation point for (-) direction NO.5421 = 300
Pitch error compensation point for (+) direction NO.5422 = 309
Pitch error compensation interval NO.1813 = 36000

2. SENTROL2 PARAMETER LIST

	7	6	5	4	3	2	1	0
0000	DC3	%OF	ARC	EIA	NCR	ISP	CTV	TVC

DC3 1: For program output, output the DC3 signal after DATA output is complete.
0: For program output, do not output the DC3 signal after DATA output is complete.

%OF 1: For program input, start the input with the CR signal.
0: For program input, start the input with the "%" + CR signal.

ARC 1 : Use "C" and "R" for the address in chamfering and corner radius.
0 : Use "I" , "K" and "R" for the address in chamfering and corner radius.
Use ",C" and ",R" for any angle chamfering and corner radius.

EIA 1 : Punch code is EIA.
0 : Punch code is ISO.

NCR 1 : In ISO code, end of block code is punched as LF.
0 : In ISO code, end of block code is punched as LF CR CR.

ISP 1 : ISO code contains no parity bit.
0 : ISO code contains a parity bit.

CTV 1 : TV check is not performed during control out.
0 : TV check is performed during control out.

TVC 1 : TV check is performed
0 : TV check is not performed.

	7	6	5	4	3	2	1	0
0011	SOF	SBO	SBC	SBM	D24	TMR	ND8	NE8

SOF 1 : Use FANUC 10/11 tape format.
0 : Use FANUC 0 tape format.

SBO 1 : Single block stop is performed in blocks which are automatically generated in NC to correct tool nose radius compensation.
0 : Single block stop is not performed.

SBC 1 : Single block stop is performed in each canned cycle.
0 : Single block stop is not performed in each canned cycle.

SBM 1 : Single block stop is performed in custom macro statement.
0 : Single block stop is not performed in custom macro statement.

D24 1 : DC2 and DC4 code are output when data is output through RS232C port.
0 : DC2 and DC4 code are not output when data is output through RS232C port

TMR 1 : Timer (cycle time) is cleared after execution of M00 or M01.
0 : Timer (cycle time) is not cleared after execution of M00 or M01.

ND8 1 : O8000~O8999 programs are not displayed on the CRT while they are executed
0 : O8000~O8999 programs are displayed on the CRT while they are executed.

NE8 1 : O8000~O8999 programs can be edited.

0 : O8000~O8999 programs cannot be edited.

	7	6	5	4	3	2	1	0
0012						SCL (M)		MIR

SCL 1 : Scaling is valid (for each axis)

0 : Scaling is not valid (for each axis)

MIR 1 : Mirror image ON (MIRROR)

0 : Mirror image OFF (NORMAL)

0020	FOREGROUNG INPUT

Specify which interface is used for foreground input device.

0 : RS232C INTERFACE 1 (COM1)

1 : RS232C/RS422 INTERFACE 2 (COM2)

0021	FOREGROUND OUTPUT

Specify which interface is used for foreground output device.

0 : RS232C INTERFACE 1 (COM1)

1 : RS232C/RS422 INTERFACE 2 (COM2)

0022	EXTERNAL INPUT

Specify which interface is used for input device to control external I/O device.

0 : RS232C INTERFACE 1

1 : RS232C/RS422 INTERFACE 2

0023	EXTERNAL OUTPUT

Specify which interface is used for external device to control external I/O device.

0 : RS232C INTERFACE 1

1 : RS232C/RS422 INTERFACE 2

0032	AUTO INCREMENT

Specify the increment value of sequence number when using the “Automatic Sequence No. Generation Function.”

Data rang: 1 ~ 127

	7	6	5	4	3	2	1	0
1000	RV1	RVM	DRO	RAB	NCE	ROS	CSZ	

RV1 1: When assigning the rotary axis, return to the origin after making one revolution.

0: When assigning the rotary axis, return to the origin without making one revolution.

RVM 1: When assigning the rotary axis, move to the - direction.

0: When assigning the rotary axis, move to the + direction.

DRO 1: Make the DIGITAL READ OUT valid.
0: Make the DIGITAL READ OUT invalid.

RAB 1: When assigning the rotary axis, indicate with absolute coordinates.
0: When assigning the rotary axis, do not indicate with absolute coordinates.

NCE 1 : The servo enable signal is not checked at servo ready check. Set"1" when using an axis as index table or with servo off function.
0 : The servo enable signal is checked at servo ready check (standard)

ROS 0 : The machine coordinate system for stroke check and automatic reference point return is rotary axis type.
1 : The machine coordinate system for system for stroke check and automatic reference point return is linear axis type.

CSZ Not used

	7	6	5	4	3	2	1	0
1004	RV-	RV+				IRP		RVS

RV- 1: When designating the rotation axis, always move in the - direction.
0: When designating the rotation axis, do not move in the - direction at all times.

RV+ 1: When designating the rotation axis, always move in the + direction.
0: When designating the rotation axis, do not move in the + direction at all times.

IRP 1: The unit to be entered for each axis should be 10-fold.
0: The unit to be entered for each axis should not be 10-fold.

RVS 1: When designating the rotation axis, move to the shortest distance.
0: Follow the values of RV- and RV+.

※ RV- and RV+ are valid if RVS is 0 and invalid if it is set as 1.

	7	6	5	4	3	2	1	0
1005	RMB	PLC	PND		DCI	ZNG	PLZ	ALZ

RMB 1 : Controlled axis detach of each axis is available.
0 : Controlled axis detach of each axis is not available.

PLC 1 : Each axis is controlled by PLC.
0 : Each axis is not controlled by PLC.

PND 1 : Position data is not displayed on the screen.
0 : Position data is displayed on the screen.

DCI 1 : Each axis is decelerated when deceleration signal of reference point return changes to 1 (high).
0 : Each axis is decelerated when deceleration signal of reference point return changes to 0 (low).

ZNG 1 : Each axis's machine lock is valid.
0 : Each axis's machine lock is invalid.

PLZ 1 : Work coordinate system is always preset when manual reference point return is completed.
0 : Work coordinate system is preset only at the first manual reference point return

ALZ 1 : Automatic reference point return (G28) uses the same sequence as manual reference point return
0 : Automatic reference point return (G28) is performed by positioning control (rapid traverse)

1020	NAME OF EACH AXIS

Assign a program axis name to each control axis according to the next table.

Axis name	Set value	Axis name	Set value	Axis name	Set value
X	88	A	65	U	85
Y	89	B	66	V	86
Z	90	C	67	W	87

1030	2 ND AUXILIARY FUNCTION

Assign an address among A,B,C,U,V and W to be Used for 2nd auxiliary function according to the Next table. Note that the address used as a control Axis name cannot be assigned as the address of the 2nd auxiliary function.

Address	Set value
A	65
B	66
C	67

1031	STANDARD AXIS

The units of the parameters common to all axes such as dry run rate vary according to the specified increment systems. This parameter is employed to refer to the units of these parameters as those of an increment system of the standard axis in case of that the specified increment system is different for each axis. Specify the sequence number of the axis which is used as the standard axis.
note)Refer to parameter 1020 for the numbers of the control axis.

1032	RELATES AXIS TO BCS

Assign each control axis to basic coordinate system according to the next table.

Set value	Meaning
0	A rotary axis
1	X axis of basic three axes
2	Y axis of basic three axes
3	Z axis of basic three axes
5	An axis parallel to X axis
6	An axis parallel to Y axis
7	An axis parallel to Z axis

1034	LINEAR AXIS FOR POLAR

Specify the control axis number of rotary axis for polar coordinate interpolation

Data range : 1~8 note)Refer to parameter 1020 for the numbers of the control axis.

1035	ROTARY AXIS FOR POLAR

Specify the control axis number of rotary for polar coordinate interpolation.

Data range : 1~5. note)Refer to parameter 1020 for the numbers of the control axis.

1040	ANGLE OF SLOPE AXIS

(ANGULAR GRINDING)

Specify the angle of X axis for the sloped axis control.

Data range : -60000~-20000, 20000~60000 Data unit : 0.001deg

Default set : 30000

	7	6	5	4	3	2	1	0
1041	RPS	OSL	SDW (C)	SAD (C)	OSS (C)	QTL (C)		AGL

RPS 1: At reference point finish and G92 coordinate setting the relative coordinate is established with the same value as the absolute coordinate.

0: At reference point return finish and G92 coordinate setting the relative coordinate is not established with the same value as the absolute coordinat.

OSL 1: The OSCILLATION function (G81.1) is valid.

0: The OSCILLATION function (G81.1) is invalid.

SDW 1: Slow up/down (automatic Acceleration/deceleration) function for water jet is valid.

0: Slow up/down (automatic Acceleration/deceleration) function for water jet is invalid.

SAD 1: Spindle Acceleration/deceleration (feed override) function is valid for blanket quilting machine.

It is used to control spindle override in PLC.

Set acceleration/deceleration section to parameter 613,6616.

Setting unit: 0.1mm

Set low speed clamp value to parameter 6610.

Setting unit: 1%

0: Spindle acceleration/deceleration (feed override) function is invalid for blanket quilting machine.

OSS 1: The OSCILLATION acceleration/deceleration type is Sin Curve.

0: The OSCILLATION acceleration/deceleration type is linear.

QTL 1: The embroidery function is valid.
(for G94, start operation at the rising edge of the INTERLOCK signal)

0: The embroidery function is invalid.

AGL 1 : Sloped axis control is performed for each axis.

0 : Sloped axis control is not performed for each axis. (For angular grinder)

	7	6	5	4	3	2	1	0
1042			SAP (SPIN)	MPV (SPIN)	SPB (SPIN)	EON (SPIN)	SOV (SPIN)	CPS

SAP 1: All Sample Data are saved.

0: To make the Data components (X, Z movement distance) between Samples identical, combine them into one Data and Count Up the Counter.

MPV 1: Manage the Teaching Data vis-à-vis the Position Data.

0: Manage the Teaching Data vis-à-vis VCmd.

SPB 1: If SAP=0, the Sample Data that was Counted Up is prepared in the number of Blocks equal to the number counted.

0: If SAP=0, the Sample Data that was Counted Up is prepared in 1 Block.

EON 1: During SERVO OFF, the Enable signal is turned ON.

0: During SERVO OFF, the Enable signal is OFF.

SOV 1: The SERVO OFF function is valid.

0: The SERVO OFF function is invalid.

CPS 1: In chopping MODE, automatic stop is rendered invalid.

0: In chopping MODE, automatic stop is rendered valid.

	7	6	5	4	3	2	1	0
1043	PST	GTF (SPIN)						

PST Not used (reserved)

GTF 1: The GAIN CONSTANT TABLE is valid.

0: The GAIN CONSTANT TABLE is invalid.

1044	SAMPLING TIMES	(SPIN)

The sampling period for the NC Interrupt period is set up.

Sampling period [ms] = NC Interrupt period (10ms) x SAMPLING TIMES

Setup value: 0 ~ 100

1220	WORK ZERO COMMON

This parameter gives the offset value common to all of the work coordinate system.

	Increment system			
	IS-A	IS-B	IS-C	Unit
Linear axis (in millimeter)	0.01	0.001	0.0001	mm
Linear axis (in inches)	0.001	0.0001	0.00001	inch
Rotary axis	0.01	0.001	0.0001	deg

Data unit : -99999999~+99999999

1221	WORK ZERO SFT #1
1222	WORK ZERO SFT #2
1223	WORK ZERO SFT #3
1224	WORK ZERO SFT #4
1225	WORK ZERO SFT #5
1226	WORK ZERO SFT #6

Work zero point offset values are established for work coordinate system 1 through 6(G54~G59) according to these parameters.

	Increme			
	IS-A	IS-B	IS-C	Unit
Linear axis (in millimeters)	0.01	0.001	0.0001	mm
Linear axis (in inches)	0.001	0.0001	0.00001	inch
Rotary axis	0.01	0.001	0.0001	deg

Setup value: -99999999~+99999999

1240	VALUE OF 1 ST R POINT
1241	VALUE OF 2 ST R POINT
1242	VALUE OF 3 RD R POINT
1243	VALUE OF 4 TH R POINT

The coordinate values of the 1st through 4th reference point are established in the machine coordinate system according to these parameters.

	Increment system			
	IS-A	IS-B	IS-C	Unit
Linear axis(in millimeters)	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

Data range : -99999999~+99999999

1260	MOVEMENT OF ROTARY

Set the movement amount of one rotation of a rotary axis. For use of the axis as a rotary axis establish this parameter without fail.

	Increment system			
	IS-A	IS-B	IS-C	Unit
Rotary axis	0.01	0.001	0.0001	deg

Data range : 0~99999999

1400

7	6	5	4	3	2	1	0
COR (M)	LAI	F05	FST	SKF	LRP	TDR	RDR

COR 1: Feed clamp function by radius of circular arc is valid.
In this case, automatic corner override function is not available.
0: Feed clamp function by radius of circular arc is invalid.

LAI 1 : Linear acceleration/deceleration after interpolation is valid.
0 : Linear acceleration/deceleration after interporation is invalid.
The acc./dec. time is set in parameter 1622.
Data range : 10 ~ 100 Unit : msec

F05 1 : In case the feedrate is selected on the soft operator's panel for speeds.
0 :Override value increases by 5%
Override value increases by 10%

FST 1 : Feed stop function is valid.
0 : Feed stop function is invalid.

SKF 1 : Feedrate of skip function is decided by the parameter(data #1428)
0 : Feedrate of skip function is decided by F code commanded on the program
*Note) This parameter is valid only when the parameter #7200 HSS is set to 0. And the PLC-NC interface signal (SKIP 1~4) is used as the skip signal.

LRP 1 : Linear interpolation type positiong (G00). Tool path is always straight line.
0 : Non-linear interpolation type positioning (G00). Independent rapid traverse for each axis is performed.

TDR 1 : Dry run is valid for thread cutting command and tapping command.
0 : Dry run is invalid for thread cutting command and tapping command.

RDR 1 : Dry run speed is valid at rapid traverse in dry run mode.
0 : Dry run speed is not valid at rapid traverse (but rapid traverse speed).

	7	6	5	4	3	2	1	0
1401	ADC (C)	ACF (C)	TRA (C)	RP4	TR8 (C)		MR2	CAL (C)

ADC 1 : Automatic acc./dec. function is valid.
0 : Automatic acc./dec. function is valid.

ACF 1 : Actual feedrate output at F12,F13 is valid.
0 : Actual feedrate output at F12,F13 is invalid.

TRA 1 : Tracing function is valid. (LASER CUTTING)
0 : Tracing function is invalid. (LASER CUTTING)

RP4 1 : Manual rapid traverse rate before ref.p.return finish is carried out at set value.
0 : Manual rapid traverse rate before ref.p.return finish is carried out at 1/4 of the set value.

TR8 1: The 8CH TRACING FUNCTION is valid (for the LASER cutter).
0: The 8CH TRACING FUNCTION is invalid (for the LASER cutter).

MR2 1 : Manual rapid traverse rate is carried out at 1/2 of the set value.
0 : Manual rapid traverse rate is carried out at the set value.

CAL 1 : The special hight sensor correction function is valid
0 : The special hight sensor correction function is not valid

	7	6	5	4	3	2	1	0
1402	JF2	CRD	RTF	---	RF0	SMC	ROV	RAT

JF2 1: FEED OVERRIDE type JOG feed is used.
0: FEED OVERRIDE type JOG feed is not used.

CRD 1: As for automatic chamfer/corner R, it is possible with no decimal point used in C and R.
0: As for automatic chamfer/corner R, it is impossible with no decimal point used in C and R.

RTF 1: In the RETURN function, move at feed rate.
0: In the RETURN function, move at DRY RUN speed.

RF0 1: Stop with rapid traverse FEED OVERRIDE 0.
0: Do not stop with rapid traverse FEED OVERRIDE 0.

SMC 1: Rapid traverse from manual operation – feed conversion (G6.7) is carried out smoothly.
0: Rapid traverse from manual operation – feed conversion (G6.7) is carried out in the existing manner.

ROV 1: The rapid traverse FEED OVERRIDE is rendered valid (valid only for 1400 LPR=0).
0: The rapid traverse FEED OVERRIDE is rendered invalid.

RAT 1: The rapid traverse acceleration/deceleration TYPE is set to the exponential type.
0: The rapid traverse acceleration/deceleration TYPE is set to the linear type.

	7	6	5	4	3	2	1	0
1403								RDA

RDA 1: The rapid traverse rate selection count is 4 (RT0~RT3).
0: The rapid traverse rate selection count is 3 (RT0~RT2).

1413	EACH AXIS MAX HANDLE FEED

CLAMP speed for each axis of handle operation
Setup value: 0~32767

	Setup Unit			
	IS-A	IS-B	IS-C	Unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

1414	N OF HANDLE FEED 1
1415	N OF HANDLE FEED 2
1416	N OF HANDLE FEED 3

The magnifications are established for the manual pulse generator according to this Parameter,
Setup value: 1~200

1422	EACH AXIS MAX FEEDRATE

The maximum feedrate is set for each axis according to this parameter.
Data unit : see next table.

	Increment system			
	IS-A	IS-B	IS-C	Unit
Linear axis	100.0	10.0	1.0	mm/min
Rotary axis	100.0	10.0	1.0	deg/min

Setup value: 1~6000

1428	SKIP FUNCTION FEEDRATE

Skip function (G31) feedrate is established according to this parameter.
This parameter is valid only the parameter #1400 SKF is set to 1.

	Increment system			
	IS-A	IS-B	IS-C	Unit
Linear axis	100.0	10.0	1.0	mm/min
Rotary axis	100.0	10.0	1.0	deg/min

Setup value: 1~32767

1494	REVERSE FEED RATE	(C)

Set up the feed rate for RETRACE function REVERSE.

	Setup Unit			
	IS-A	IS-B	IS-C	Unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

Setup value : 1~32767

1500	RAPID TRAVERSE RATE 0

1501	RAPID TRAVERSE RATE 1

1502	RAPID TRAVERSE RATE 2

Specify rapid traverse rate(RT0~RT2) for each axis.

Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	100.0	10.0	1.0	mm/min
Rotary axis	100.0	10.0	1.0	deg/min

Setup value: 1~9800
(for the I TYPE, 1~12000 distribution cycle 8ms and 1~24000 distribution Cycle 4ms for high-speed machining)

1503	JOG FEED RATE
:	:
1523	JOG FEED RATE

Specify the steps of jog federate. They are common to all of axes.

The maximum federate(Vmax) can be calculated as following,

Vmax(mm/min) = Maximum motor speed(rpm)×Axis moving distance per a revolution(mm)

Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

Setup value: 1~32767

1524	EACH AXIS JOG FEED RATE

Set up the JOG feed rate for each axis (valid only when No.1402 JF2 =1, however).

	Setup Unit			
	IS-A	IS-B	IS-C	Unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

Setup value: 1~32767

1525	RAPID TRAVERSE RATE 3

For each axis, set up rapid traverse rate RT3 (valid only when No.1403 RDA=1, however).
Content is the same as 1500~1502.

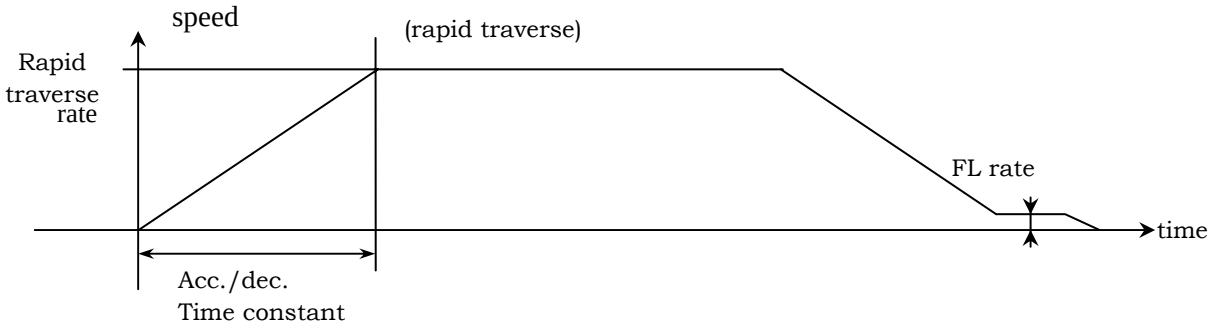
	7	6	5	4	3	2	1	0
1601						OVB		-

OVB 1: The Block Overlap function is used.
0: The Block Overlap function is not used.

1620	TIME CONSTANT (RAPID)

Linear type rapid traverse acceleration/deceleration time constant is established for each axis according to this parameter.

Data range : 0~1000 Data unit : msec



1621	FL (RAPID)

Linear type rapid traverse accleration/deceleration FL rate is established for each axis

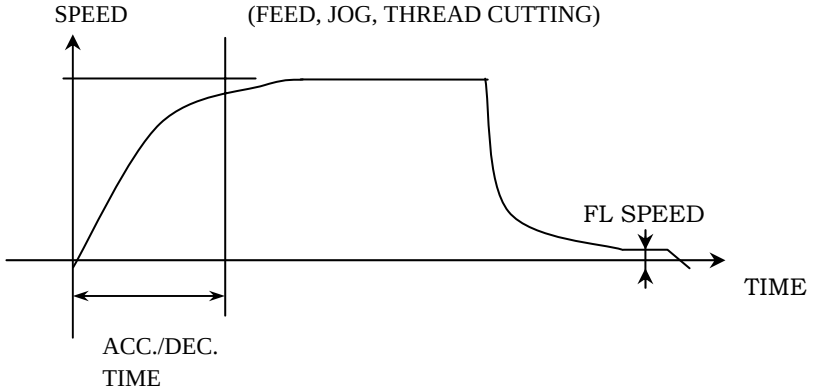
Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

Data range : 0~32767

1622	TIME CONSTANT (FEED)

Cutting feed acceleration/deceleration(exponential type) time constant is established for each axis

Data range : 0~4000 Data unit : msec



1623	FL (FEED)

Feed acceleration/deceleration FL rate is established for each axis according to this parameter. 0 should be set in this parameter, otherwise the correct straight line or arcshapes cannot be obtained.

Axis type	Increment system			
	IS-A	IS-B	IS-C	Unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

Data range : 0~32767

1624	TIME CONSTANT (JOG)

Jogging acceleration/deceleration (exponential type) time constant is established for each axis according to this parameter.

Data range : 0~4000 Data unit : msec

1625	FL (JOG)

Jogging acceleration/deceleration FL rate is established for each axis according to this parameter.

Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

Data range : 0~32767

1626	TIME CONSTANT (THREAD)

Tread cutting acceleration/deceleration time constant is established for each axis according to this parameter.

Data range : 0~4000 Data unit : msec

1627	FL (THREAD)

Thread cutting acceleration FL rate is established for each axis according to this parameter.

Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

Data range : 0~32767

1628	TIME CONSTANT (OSCILLATION)

For each axis, set up the time constant for the OSCILLATION function acceleration/deceleration (refer to the parameter NO.1622 figure).

Setup value: 0~4000 Unit: ms

1629	FL (OSCILLATION)

For each axis, set up the FL speed for the OSCILLATION function acceleration/deceleration (refer to the parameter NO.1622 figure).

	Setup Unit			
	IS-A	IS-B	IS-C	Unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

Setup value: 0~32767

1630	TIME CONSTANT (MARKING)

For each axis, set up the time constant for the MARKING feed acceleration/deceleration (refer to the parameter NO.1622 figure).
Setup value: 0~4000 Unit: ms

1631	FL (MARKING)

For each axis, set up the FL speed for the MARKING feed acceleration/deceleration (refer to the parameter NO.1622 figure).

	Setup Unit			
	IS-A	IS-B	IS-C	Unit
Linear axis	10.0	1.0	0.1	Mm/min
Rotary axis	10.0	1.0	0.1	Deg/min

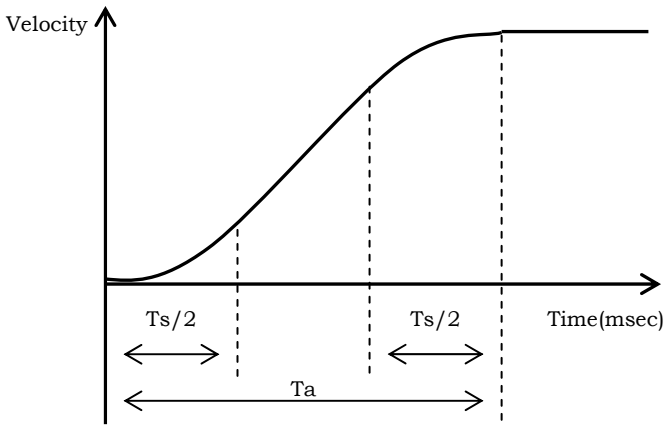
Setup value: 0~32767

1632	TIME CONSTANT A (RAPID)

For each axis, set up the time constant for the rapid traverse BELL type acceleration/deceleration (linear); refer to the parameter NO.1633 figure.
Setup value: 0~4000 Unit: ms

1633	TIME CONSTANT S (RAPID)

For each axis, set up the time constant for the rapid traverse BELL type acceleration/deceleration (curve).
Setup value: 0~4000 Unit: ms



1800	SERVO AXIS NO.

Relates each control axis to a servo axis. Normally, set the same value as the control axis sequence number to the servo axis number.

If a same servo axis number is set to more than 2 control axes, the largest control axis becomes valid.

Data range : 0~8(1~3, 5~7 : servo axis I/F, 4,8 : spindle I/F)

Setting example 1. Lathe (2 servo axes (X and Z)+spindle)

1800 X 1
Z 2
C 4 (spindle)

Setting example 2. Milling (3 servo axes (X, Y and Z)+spindle)

1800 X 1
Y 2
Z 3
C 4 (spindle)

Setting example 3. Machining center (7 servo axes (X, Y, Z, A, U, V and W)+spindle)

1800 X 1
Y 2
Z 3
A 4
U 5
V 6
W 7
C 8 (spindle)
1817 A URO 1 (1 is set if the spindle I/F is used as servo axis I/F.)

1801	ENCODER TYPE

Set the number of pulses per pulse coder rotation for each axis.

Data range : 100~25000 Data unit : PPR

1802	MOVING MULTIPLY

Set the machine movement per motor rotation for each aixs.

Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	0.01	0.001	0.001	mm
Rotary axis	0.01	0.001	0.001	deg

Data range : 0~32767

1803	POSITION LOOP GAIN

Position control loop gain is specified for each axis. For a machine which performs linear or circular interpolation cut, specify the same value for all of the axes. For a machine which only requires positioning, different values may be specified for different axes. The larger the loop gain, the higher the position control response. But if it is too large, the servo system becomes unstable.

Data range : 500~10000 Data unit : 0.01/sec Default value : 3000

1804	STOP POS ERR LIMIT

Position deviation limit value at stop is specified for each axis. If the position deviation exceeds the limit value when the axis movement stops, a servo alarm occurs and the machine stops instantly

Data range : 100 ~ 5000 Data unit : Detection unit

1805	MOVING POS ERR LIMIT

Position deviation limit value during axis movement is specified for each axis.

If the position deviation exceeds the limit value while moving, a servo alarm occurs

And the machine stops instantly.

$$\text{ERROR LIMIT} = \frac{\text{Rapid Trav.(mm/min.)} \times \text{ENCODER PULSE(PPR)} \times 2}{\text{PITCH(mm/rev)} \times \text{PISITION LOOP GAIN(1/s)} \times 60} \times 1.2$$

Data range : 100~25000 Data unit : Detection unit

1806	SERVO OFF POS ERR LIMIT

Position deviation limit value at servo off is specified for each axis.

Data range : 100~5000 Data unit : Detection unit

1807	GAIN CONSTANT

Specify the velocity command voltage to rotate the servo motor at 1000rpm.

For example, if the servo motor rotates at 1000rpm with 4 volt, set 4000.

Data range : 1000 ~ 8000 Data unit : mV/1000rpm Default set : 3500

1808	INPOSITION WIDTH

In-position width is specified for each axis. If the deviation of the machine position from the command position is less than the in-position width, it is assumed that the machine has reached the command position or is in-positioned.

Data range : 1 ~ 100 Data unit : Detection unit

1809	RPR FEED LOW

Feedrate(FL) after deceleration in reference point return is established for each axis according to this parameter.

Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	10.0	1.0	0.1	mm/min
Rotary axis	10.0	1.0	0.1	deg/min

1810	RP SHIFT AMOUNT

Specify the grid shift amount for each axis.

Data range : -25000 ~ 25000 Data unit : Detection unit

1811	BACK LASH COMPEN

Specify the backlash compensation amount for each axis. After power is turned on, the first backlash compensation is performed when an axis moves in the direction opposite to the reference point return direction.

Data range : 0 ~ 32767

Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

1812	SERVO OFF DELAY TIME

Specify the delay time of servo system to be set off when emergency stop switch was pushed. This parameter is used to keep the heavy weighted axis from dropping by turning off the servo system after the brake holds the axis.

Data range : 0 ~ 127 Data unit : 10ms

1813	PITCH INTERVAL

Specify the compensation intervals at pitch error compensation of each axis.

Data range : -99999999~99999999

Axis type	Increment system			
	IS-A	IS-B	IS-C	Unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

	7	6	5	4	3	2	1	0
1814	MAG	HSP	RET	RDI	REV	MRW	ISF	ISR

MAG 1 : Each axis's control axis detach signal is valid.

0 : Each axis's control axis detach signal is invalid.

HSP 1 : High speed positioning is performed. In this case, parameter #1825 must be set properly.

RET 1: After the reference point return deceleration, the direction of movement is reversed if Z pulse is received.

0: After the reference point return deceleration, the direction of movement is not reversed even if Z pulse is received.

0 : High speed positioning is not performed.

RDI 1 : Reference point return direction is "-" axis direction for each axis.

0 : Reference point return direction is "+" axis direction for each axis.

REV 1 : Specify as rotary axis for each axis.

0 : Specity as non-rotary axis for each axis.

MRW : Servo motor rotates in one direction..

ISF
ISR

ISF	ISR	Least command increment	Abbreviation
0	0	0.001mm, 0.001deg	IS-B
0	1	0.01mm, 0.01deg	IS-A
1	0	0.0001mm, 0.0001deg	IS-C

	7	6	5	4	3	2	1	0
1815	SAC	OHC	VOC	F1C		SOC		

SAC 1 : Cancel next alarms : over load, over heat, encoder disconnection, voltage alarm, V ready ON/OFF, over current. Diagnosis 0010 EBL, PRD display "1" but PREADY ENABLE signal does not display "1".

0 : Next alarms are not canceled : over load, over heat, encoder disconnection, voltage alarm, V-ready ON/OFF, over current.

OHC 1 : Motor overheat cancel function is valid.

0 : Motor overheat cancel function is invalid.

VOC 1 : V READY ON/OFF check cancel function is valid.

0 : V READY ON/OFF check cancel function is invalid.

F1C 1 : Encoder feedback counter check cancel function is valid.

0 : Encoder feedback counter check cancel function is invalid.

SGM 1 : Use YASKAWA SIGMA SERIES SERVO DRIVE/MOTOR.
Can be displayed SERVO ALARM

0 : Do not use YASKAWA SIGMA SERIES SERVO DRIVE/MOTOR

SOC 1 : Servo off error check cancel function is valid.

0 : Servo off error check cancel function is invalid.

	7	6	5	4	3	2	1	0
1816	EMH	AVO	EVF	MPS	M10	ACP	VRA	ALB

EMH 1 : The function is 100 times as valid as encoder pulse setting value.
The setting unit of parameter 1801 encoder type is 0.01PPR.
If this function is valid, the setting unit of parameter 1802 is also 1/100.
0 : The function is 100 times as invalid as encoder pulse setting value.
The setting unit of parameter 1801 encoder type is 0.01PPR.

AVO 1 : EPS3 analog voltage output function is valid.
0 : EPS3 analog voltage output function is invalid.

EVF 1 : Follow up is valid with servo OFF. (mechanical handle used)
0 : Follow up is invalid with servo OFF.

MPS 1 : Machine origin point shift function is valid.
0 : Machine origin point shift function is invalid

M10 1 : The unit of parameter 1802 MOVING MULTIPLY is multiplied by 10.
0 : The unit of parameter 1802 MOVING MULTIPLY is not multiplied by 10.

ACP 1 : SERVO ALARM, ENCODER DISCONECT and V-READY ON/OFF ALARM are not checked, when P-READY signal is off.
0 : SERVO ALARM, ENCODER DISCONECT and V-READY ON/OFF ALARM are checked, when P-READY signal is off.

VRA 1 : V READY signal is normally open contact.
0 : V READY signal is normally closed contact.

ALB 1 : V READY signal is A contact.
0 : SERVO ALRAM signal is B contact.

Standard setting value for difference servo units.

	SERVO UNIT		ACP	VRA	ALB
1	YASKAWA SIGMA/ SIGMAⅡ SERIES		0	1	0
2	LG FDA-5000 SERIES	FDA-5001~04	1	1	0
		FDA-5005~45	0		
3	PANASONIC MINAS SERIES		0	1	0

	7	6	5	4	3	2	1	0
1817	UR7	UR6	UR5	UR4	UR3	UR2	UR1	UR0

UR7 1st axis 1: Interrupt SYSTEM ERROR 14004 and 14007 are ignored.
2nd axis 1: Interrupt SYSTEM ERROR-related DATA is displayed.
3rd axis 1: The Time Chart function is segmented.
4th axis 1: LAN TYPE DNC is operated.
5th axis 1: Interrupt SYSTEM ERROR 13000~ is ignored.

UR6 1: During simple synchronization control, the Grid Shift is synchronized as well.
0: During simple synchronization control, the Grid Shift is not synchronized.

UR5 1 : Change meaning of parameter 1810. 10 times or 100 times is determined according to 1816 M10 or 1817 UR2.
(Valid up to 1000 times in case of 9090 DB6 = 1)
0 : Do not change meaning of parameter 1810.

UR4 1 : Change meaning of parameter 1816.
(Valid only in case of 1816 M10=1 and 1817 UR2=1)
Setting unit of moving multiply: 1000 times
0 : Do not change meaning of parameter 1816.

UR3 1 : Use absolute encoder.
0 : Do not use absolute encoder.

UR2 1 : Change meaning of parameter 1810.
Setting unit of moving multiply: 100 times
0 : Do not change meaning of parameter 1816.
Setting unit of moving multiply: 10 times

UR1 1 : Cs axis is valid. (Valid only in case of UR0 = 1)
0 : Cs axis is invalid.

UR0 1 : Use spindle I/F as servo axis.
0 : Do not use spindle I/F as servo axis.

	7	6	5	4	3	2	1	0
1818					DPF	GCT (SPIN)	MDR	NDR

DPF 1: The DUAL POSITION FEEDBACK function is valid.
0: The DUAL POSITION FEEDBACK function is invalid.

GCT 1: This is used as the target axis of the GAIN CONSTANT TABLE.
0: This is not used as the target axis of the GAIN CONSTANT TABLE.

MDR 1: The shortest distance selection function for the reference point return without reference point DOG is valid.
0: The shortest distance selection function for the reference point return without reference point DOG is invalid.

NDR 1: The reference point return function without reference point DOG is valid.
0: The reference point return function without reference point DOG is invalid.

1821	FEED FORWARD GAIN

Specify the feed forward gain constant.

Data range : 0~25000

1822	DRIFT AMOUNT

Specify drift compensation amount for each axis when the parameter #1823 ADF is set to 0.

Data range : -2000~2000 Data unit : velo(1velo=0.31mv)

	7	6	5	4	3	2	1	0
1823	ADF	DIA (L)	AUG		ERC	P1O		

ADF 1 : Automatic drift compensation is performed.
0 : Automatic drift compensation is not performed.

DIA 1 : Each axis movement amount is specified by diameter.
0 : Each axis movement amount is specified by radius.

AUG 1 : Automatic gain compensation is performed.
0 : Automatic gain compensation is not performed.

ERC 1 : Reference point is lost by emergency stop on.
0 : Reference point is not lost by emergency stop on.

P10 1 : The setting unit of parameter 1801 encoder type increases to 10 times.
0 : The setting unit of parameter 1801 encoder type does not increases to 10 times.

1824	ZERO PULSE WIDTH

Specify the encoder's zero width signal for each axis.

Data unit : Detection unit Data range : 0~50

How to find out the set value : Set the parameter #1824=0 first of all and turn off the power. Turn on the power again, make a reference point return. Then DIAG 0012 will display some values while an axis moves and also display the different value when the axis move direction changes. Find the maximum value of DIAG 0012 and set the absolute value of that maximum value to this parameter.

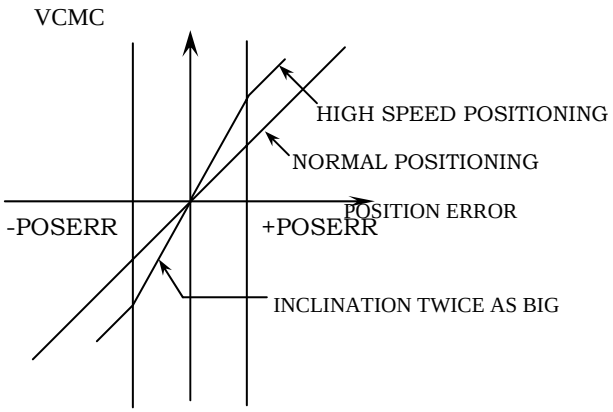
example) YASKAWA SIGMA, HYOSUNG YASKAWA AC SERVO : 4
LG AC SERVO, PANASONIC MINAS AC SERVO : 4

1825	GAIN CHANGE POS ERR

Specify the maximum amount of position error when high speed positioning is executed

Data unit : Detection unit Data range : 0~25000

This parameter is invalid when parameter 1814 HSP is set to 0.



POSITION ERROR/VCMD GRAPH

1826	F/B PULSE CHECK DATA

When power is turned on, servo motor rotates as mush as set in this parameter to check if feedback pulse is generated normally.

When this parameter is set to 0, feedback pulse check sepuence is not performed. Set 0 for those motors which have brake system, they cannot perform the check sequence normally.

Data unit : Detection unit Data range : -500 ~ 500 Default set : 50

1827	BACK LASH MAX LIMIT

Set the maximum limit of backlash compensation amount for each axis. If the value exceeds the maximum limit, divide the backlash compensation amount and perform the setup. (It the amount is 0, set to 256 according to previous standard.)

Setting value: 0~256

Axis type	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

1828	ELECTRONIC GEAR (NUMERATOR)

Set up the numerator (A) for the gear ratio. This is used if the rotary axis or GEAR ratio is a fractional value.

Setup value: 0~99999999 4byte data

1829	ELECTRONIC GEAR (DENOMINATOR)

Set up the denominator (B) for the gear ratio. This is used if the rotary axis or GEAR ratio is a fractional value.

Setup value: 0~99999999 4byte data

The gear ratio range must satisfy the following: 0.01<= A/B <= 100.

1832	FEED STOP POSITION

Specify feedstop position deviation for each axis. If the position deviation exceeds the feedstop position deviation while moving, pulse distribution and acceleration/deceleration controls are temporarily stopped.

When the position deviation becomes less than the feedstop position deviation, the pulse distribution and acceleration/deceleration controls are restarted.

Data unit : Detection unit Data range : 0~32767

1833	CLAMP VOLTAGE

Set up the control value for the hydraulic Servo minimum speed Clamp.

Setup value: 0~32767 Unit: Detection unit (PULSE)

1834	2ND INPOSITION WIDTH

G00 in-position check value if inplevel=6 from G code C64.1

Setup value: 0~32767 Unit: Detection unit (PULSE)

1841	GAIN CONSTANT TABLE 1	(SPIN)
1842	GAIN CONSTANT TABLE 2	(SPIN)
1843	GAIN CONSTANT TABLE 3	(SPIN)
1844	GAIN CONSTANT TABLE 4	(SPIN)
1845	GAIN CONSTANT TABLE 5	(SPIN)
1846	GAIN CONSTANT TABLE 6	(SPIN)
1847	GAIN CONSTANT TABLE 7	(SPIN)
1848	GAIN CONSTANT TABLE 8	(SPIN)
1849	GAIN CONSTANT TABLE 9	(SPIN)

GAIN CONSTANT value for each axis

Select the TABLE number with the following 4 bits: G262.0~G262.3.

Setup value: 1000 ~ 65535

1860	BL ACCEL VALUE

Set the acceleration amount of the backlash acceleration function.

Data unit : 3.05mV Data range : 0~4095 Default set : 0

1861	BL ACCEL TIME

Set the accelerating time of backlash acceleration function.

Data unit : msec(10msec) Data range : 0~127 Default set : 0

1862	BL ACCEL STOP

Set the move amount of the backlash acceleration function at acceleration stop. Acceleration will stop if the move amount after direction change exceeds this value.

Data unit : pulse Data range : 0~127 Default set : 0

1863	BL ACCEL VALUE 2

Acceleration value for backlash acceleration function is set. (Direction moves from + to -.)
Setting to 0 invalidates the function.

Setting Unit: 3.05mV Setting value: 0 ~ 4095 Standard value: 0

1870	DUAL POS FB IN

Set up the ENCODER Input PORT for the FULLY CLOSED LOOP used in DUAL POSITION FEEDBACK with the control axis number.

For example, to connect the detector for the FULLY CLOSED LOOP in the X axis (first axis) to the fifth axis, set the 1870 parameter to 5.

An 8-axis NC may be set to 8, and a 16-axis NC, to 16.

Set the DUAL POSITION FEEDBACK control function to 0 when not in use.

Setup range: 0~16

1871	DUAL POS FB A

1872	DUAL POS FB B

In the DUAL POSITION FEEDBACK function, set up the ratio for converting the separate placement-type detector signal used in the FULLY CLOSED LOOP to a unit for the SEMI-CLOSED LOOP detector in the numerator (1871) and the denominator (1872).

Ex.) If the SEMI-CLOSED LOOP unit is 0.00025 mm, and the FULLY-CLOSED LOOP unit, 0.001 mm, the SEMI-CLOSED LOOP and the FULLY CLOSED LOOP generate 4000 pulses and 1000 pulses, respectively, when moving 1 mm.

Since A/B = 4000/1000, set up as **A** (1871) **= 4**, **B** (1872) **= 1**.

Any one side set to 0 is treated as a 1:1 ratio.

1873	DUAL POS FB TC

For the DUAL POSITION FEEDBACK control function, set up the time constant of the first order lag system for error compensation.
If set to 32767, the time constant becomes infinite, and compensation does not occur.
Setup unit: mm Setup range: 0~32767 Standard value: 10000

1874	DUAL POS ZERO WIDTH<?>

For the DUAL POSITION FEEDBACK control function, set up the compensation override range.
If the difference between FEEDBACK from the FULLY CLOSED LOOP and FEEDBACK from the SEMI-CLOSED LOOP is lower than the setup value, compensation is not executed.
Setup unit: Detection unit for the SEMI-CLOSED LOOP
Setup range: 0~32767 Standard value: 10

1875	CLOSED LOOP REF COUNTER

When using the DUAL POSITION FEEDBACK control function, the REFERENCE COUNTER value for the FULLY CLOSED LOOP is set up for each axis.
Setup unit: Detection unit for FULLY CLOSED LOOP
Setup range: 0~32767 Standard value: 10

1876	CLOSED LOOP RP SHIFT

When using the DUAL POSITION FEEDBACK control function, set up the origin GRID SHIFT amount of each axis for the FULLY CLOSED LOOP.
To SHIFT the GRID position, set up the GRID SHIFT amount.
If the DATA sign is ＋, the GRID will SHIFT in the ＋ direction; if the DATA sign is –, the GRID will SHIFT in the - direction. The GRID SHIFT amount cannot exceed the REFERENCE COUNTER value of 1875.
Setup unit: Detection unit for the FULLY CLOSED LOOP
Setup range: -32767~32767 Standard value: 0

	7	6	5	4	3	2	1	0
2000				OPS	STR			

OPS 1 : Cycle operating signal is turned on when searching for a sequence number.

0 : Cycle operating signal is not turned on when searching for a sequence number.

STR 1 : Cycle start lamp signal is output when programs are loaded by cycle start signal in part program edit mode. (refer to parameter #2200 RDS)

0 : Cycle start lamp signal is not output when programs are loaded by cycle start signal in part program mode.(refer to parameter #2200 RDS)

	7	6	5	4	3	2	1	0
2001	EDT	MMC	SWD	DLO	MNL	RAM	LWS	SQC

EDT 1 : Use background I/O function (SOFT DKU).

0 : Do not use background I/O function (SOFT DKU).

MMC 1: Multiple M-codes in one block can be commanded(max.4)

0: Only one M-codes command per block is allowed.

SWD 1 : Servo feedback graphic display screen can be selected.

0 : Servo feedback graphic display screen cannot be selected.

DLO 1 : Display the spindle load on machine operator panel.

0 : Display the spindle load on the screen.

MNL 1 : Output signal is forced to output by manual operation in PLC diagnostic display.

0 : Output signal is not forced to output by manual operation in PLC diagnostic display.

RAM 1 : PLC SEQUENCE as written in RAM is valid(RAM operation)

0 : PLC SEQUENCE as written in ROM is valid(no RAM operation)

LWS 1: During SEQUENCE COMPILE, the LOW LEVEL partition is valid.

0: During SEQUENCE COMPILE, the LOW LEVEL partition is invalid.

SQC 1 : PLC sequence editing on screen is possible.

0 : PLC sequence editing on screen is not possible.

	7	6	5	4	3	2	1	0
2003					BSN	TSN	SSN	MSN

BSN 1 : Minus sign “-“ can be used in the second auxiliary function.

0 : Minus sign “-“ cannot be used in the second auxiliary function.

TSN 1 : Minus sign “-“ can be used in T code

0 : Minus sign “-“ cannot be used in T code.

SSN 1 : Minus sign “-“ can be used in S code.

0 : Minus sign “-“ cannot be used in S code.

MSN 1 : Minus sign “-“ can be used in M code.

0 : Minus sign “-“ cannot be used in M code.

	7	6	5	4	3	2	1	0
2004	OF7	OF6	OF5	OF4	OF3	OF2	OF1	HOB

OF7 1 : Contents of F7 soft key on the program screen (soft op.panel switch “CLNT CAN”) is not displayed.

0 : Contents of F7 soft key on the program screen (soft op.panel switch “CLNT CAN”) is displayed.

OF6 1 : Contents of F6 soft key on the program screen (soft op.panel switch “CLNT CAN”) is not displayed.

0 : Contents of F6 soft key on the program screen (soft op.panel switch “CLNT CAN”) is displayed.

OF5 1 : Contents of F5 soft key on the program screen (soft op.panel switch “M01”) is not displayed.

0 : Contents of F5 soft key on the program screen (soft op.panel switch “M01”) is displayed.

OF4 1 : Contents of F4 soft key on the program screen (soft op.panel switch “SNGL BLOK”) is not displayed.

0 : Contents of F4 soft key on the program screen (soft op.panel switch “SNGL BLOK”) is displayed.

OF3 1 : Contents of F3 soft key on the program screen (soft op.panel switch “OPT.SKIP”) is not displayed.

0 : Contents of F3 soft key on the program screen (soft op.panel switch “OPT.SKIP”) is displayed.

OF2 1 : Contents of F2 soft key on the program screen (soft op.panel switch “DRY RUN”) is not displayed.

0 : Contents of F2 soft key on the program screen (soft op.panel switch “DRY RUN”) is displayed.

OF1 1 : Contents of F1 soft key on the program screen (soft op.panel switch “CHIP CONV”) is not displayed.

0 : Contents of F1 soft key on the program screen (soft op.panel switch “CHIP CONV”) is displayed.

HOB 1 : Gear ratio of the spindle position coder is 2:75(for hobbing m/c)

0 : Gear ratio of the spindle position coder is 1:1

2020	OP PANEL PLUS BUTTON

Specify the operators panel numeric value key number which instructs the manual feed positive(+) direction on the software operators panel.

Data unit : Integer Data range : 0~9

2021	OP PANEL RPR BUTTON

Specify the operators panel numeric value key number which instructs the manual reference point return direction on the software operators panel.

Data unit : Integer Data range : 0~9

2030	ALLOWABLE DIGITS M

2031	ALLOWABLE DIGITS S

2032	ALLOWABLE DIGITS T

2033	ALLOWABLE DIGITS 2ND

Specify the allowable digits in the M,S,T and the second auxiliary function code.

Data unit : Integer Data range : 1~8

2034	FEED OVERRIDE STEP

Specify the max. number of step for the feed override/jog feed bar display.

Data range : 0~21 Standard setting : SOFT OP PANEL : 21 HARD OP PANEL : 15

2049	WORK NO. SEARCH METHOD

When set value is 0 to 99 : External work number search is done only in those program numbers whose higher two digits is same as the set value.

When set value is less than 0 or larger than 99 : External work number search is done ignoring the higher two digits of the program number.

If there are more than one program found, they are searched by registered order.

Data range : -127~127

	7	6	5	4	3	2	1	0
2200	DGD	RDS	PAL	NM9	NPE	RAL	REP	RDL

DGD 1 : In DNC mode the graphic menu is displayed.
0 : In DNC mode the graphic menu is not displayed.

RDS 1 : The register of programs by cycle start signal under part program edit mode is valid.
0 : The register of programs by cycle start signal under part program edit mode is invalid.

PAL 1 : All programs are punched out when punching the program with external I/O device control.
0 : A single program is punched out when punching the program with external I/O device control.

NM9 1 : M99 is not assumed as the program end when programs are loaded.
0 : M99 is assumed as the program end when programs are loaded.

NPE 1 : M02, M30 and M99 should not be assumed as program end when programs are loaded.
0 : M02, M30 and M99 should be assumed as program end when programs are loaded.

RAL 1 : All programs are registered when registering the program with external I/O devices control or with cycle start signal.
0 : A single program is registered when registering the program with external I/O devices control or with cycle start signal.

REP 1 : If the program with the same program number as the already loaded program is loaded, the already loaded program is deleted first, then the attempted program is loaded.
0 : If the program with the same program number as the already loaded program is loaded, an alarm is indicated.

RDL 1 : Previously loaded programs are deleted and programs are loaded when programs are loaded by external I/O control.
0 : Programs are loaded without deleting the previously loaded programs when programs are loaded by external I/O control.

	7	6	5	4	3	2	1	0
2201	HSC	DEL	LSP	MRH	ND9	NE9	PDR	

HSC 1 : High speed canned cycle is valid.
0 : High speed canned cycle is invalid.

DEL 1 : The cancel menu on the program list in edit mode is not displayed.

0 : The cancel menu on the program list in edit mode is displayed.

LSP 1 : Restrict editing program with not less than 5 MB.

0 : Do not restrict editing program with not less than 5 MB

MRH 1 : (Total running time) value can be changed.

0 : (Total running time)value cannot be changed.

ND9 1 : Programs O9000~O9999 are mot displayed during execution.

0 : Programs O9000~O9999 are displayed during execution.

NE9 1 : Programs O9000~O9999 cannot be edited.

0 : Programs O9000~O9999 can be edited.

PDR 1 : At power on the program table will be displayed as a programming screen.

0 : At power on the last program will be displayed as a programming screen.

	7	6	5	4	3	2	1	0
2202			MSD			DTL	HCH	MBL

MSD 1 : CYCLE TIME is displayed in seconds.

0 : CYCLE TIME is displayed in units of 10msec.

DTL 1 : Absolute coordinate position is displayed with not tool length(tool pos.) offset.

0 : Absolute coordinate position is displayed with tool length(tool pos.) offset.

HCH 1 : AUTO program displayed appears in a small letter.
0 : AUTO program displayed appears in a big letter.

MBL 1 : Set the number of previously translated program block to 100.

0 : Set the number of previously translated program block to 4.

	7	6	5	4	3	2	1	0
2203	COL	TCC	RC2	RC1	RC0	TC2	TC1	TC0

COL	TCC	COLOR Display Method
1	1	Change the COLOR and display the cutting processing path each time a tool is replaced.
0	1	The tool path is displayed using a COLOR between TC0~2.
1	0	The rapid traverse and cutting feed are displayed using a COLOR between RC0~2 and TC0~2, respectively.
0	0	Change the COLOR and display the path each time a tool is replaced.

RC2	RC1	RC0	COLOR
0	0	0	YELLOW
0	0	1	RED
0	1	0	GREEN
0	1	1	WHITE
1	0	0	CYAN
1	0	1	MAGENTA
1	1	0	BLUE
1	1	1	BLACK

TC2	TC1	TC0	COLOR
0	0	0	YELLOW
0	0	1	RED
0	1	0	GREEN
0	1	1	WHITE
1	0	0	CYAN
1	0	1	MAGENTA
1	1	0	BLUE
1	1	1	BLACK

Note) If TCC=1, the first COLOR after POWER ON is a COLOR between TC0~2.
Each time tool replacement occurs, the COLOR changes according to the order in the table. For example, when starting with GREEN, the succeeding COLOR is WHITE, CYAN, and MAGENTA. In this case, however, BLACK is ignored, and YELLOW follows BLUE.

2210	PARAMETER DISPLAY AXIS

Specify the number of axes to display the parameter data.

Data range : 1~8

2211	POSITION DISPLAY AXIS

Specify the number of axes to display the position data.

Data range : 1~8

	7	6	5	4	3	2	1	0
2400	DPF [L]	GSC (L)	GSB (L)	DWL		DPQ	SCA	DPI

DPF 1: Recognize Feed that has been commanded without a decimal point as 1 mm/min unit.
0: Recognize as an input unit.

GSC	GSB	G CODE SELECTION
0	0	G CODE SYSTEM A
0	1	G CODE SYSTEM B
1	0	G CODE SYSTEM C

DWL 1 : Dwell(G94) is dwell in second in the feed per minute mode(G94) or dwell in revolution in the feed per revolution mode(G95)

0 : Dwell(G04) is always dwell in second.

DPQ 1: With the G32 command issued, process the decimal point for Q Address.
0: The decimal point cannot be used. The internal unit is 0.001deg.

SCA 1: In case of thread cutting, the starting angle is assigned in 0.001deg units.
0: In case of thread cutting, the starting angle is assigned in 1deg units.

DPI 1 : Decimal point is entered by calculator method.

0 : Decimal point is entered by conventional method.

Command	Calculator method	Conventional method
X1000	1000 mm	1 mm
X1000.	1000 mm	1000 mm

	7	6	5	4	3	2	1	0
2401	G64	NCM	G18	G95			G90	G01

G64 Not used

NCM 1 : The next modal information is not cleared by reset.

0 : The next modal information is cleared by reset.

G00~G03, G17~G19, G43~G49, G54~G59, G90~G91,

G93~G95, G96~G97, F, H, S, T code.

G18 1 : G18(ZX plane) mode is entered when power is turned on or when the system is cleared.

0 : G17(XY plane) mode is entered when power is turned on or when the system is cleared.

G95 1 : G95(feed per revolution) mode is entered when power is turned on or when the system is cleared.

0 : G94(feed per minute) mode is entered when power is turned on or when the system is cleared.

G90 1 : G90(absolute) mode is entered when power is turned on or when the system is cleared.

0 : G91(incremental) mode is entered when power is turned on or when the system is cleared.

G01 1 : G01(linear interpolation) mode is entered when power is turned on or when the system is cleared.

0 : G00(rapid traverse) mode is entered when power is turned on or when the system is cleared.

2410	ARC RADIUS ERROR

Specify a limit value as difference between start point radius and end point radius for circular interpolation command.

	Increment system			
	IS-A	IS-B	IS-C	unit
Millimeter system	0.01	0.001	0.0001	mm

Data range : 0~99999999

2426	WORK COUNT UP M CODE

Allow the M code that COUNTS UP the number of work pieces to be set up.

Setup value: 0~97

2900	DOUBLE TURRETS DISTANCE	(L)

When mirror image for double turrets function is used, specify the distance between the double turrets.

	Increment			
	IS-A	IS-B	IS-C	unit
Millimeter system	0.01	0.001	0.0001	mm

Data range : -99999999 ~ +99999999

5001	IO I/F NO. (RS232C 1)

Specify the I/O device number to be connected to the RS 232C interface 1. Set the device specifications corresponding to I/O device number 1 to 6 in parameter 5110~5162.

Data range : 1~6

5002	IO I/F NO. (RS232C 2)

Same as 5001

5110	DEVICE NUMBER 1

Specify the specification number of I/O device corresponding to device number 1. The relationships between specifications numbers and I/O devices are follows:

Spec.No	I/O device specifications
1	Use control codes(DC1~DC4) and punch a feed
2	Use no control codes (DC1~DC4) and punch a feed
3	Use control codes(DC1~DC4) and punch no feed
4	Use no control codes(DC1~DC4) and punch no feed

Data range : 1~4

5111	STOP BITS 1

Specify the number of stop bits of I/O device corresponding with device number 1.

Data range : 1~2

5112	BAUD RATE 1

Specify the baud rate of I/O device corresponding with device number 1.

The relationship between set value and I/O device is as follows;

Set value	BAUD RATE (BPS)
8	1200
9	2400
10	4800
11	9600
12	19200
13	38400

5120	DEVICE NUMBER 2

Specify the specification number of I/O device corresponding to device number 2.

Data range : 1~4

5121	STOP BITS 2

Specify the number of stop bits of I/O device corresponding with device number 2.

Data range : 1~2

5122	BAUD RATE 2

Specify the baud rate of I/O device corresponding with device number 2.

Data range : 8~13

5130	DEVICE NUMBER 3

Specify the specification number of I/O device corresponding to device number 3.

Data range : 1~4

5131	STOP BITS 3

Specify the number of stop bits of I/O device corresponding with device number 3

Data range : 1~2

5132	BAUD RATE 3

Specify the baud rate of I/O device corresponding with device number 3.

Data range : 8~13

5140	DEVICE NUMBER 4

Specify the specification number of I/O device corresponding to device number 4.

Data range : 1~4

5141	STOP BITS 4

Specify the number of stop bits of I/O device corresponding with device number 4

Data range : 1~2

5142	BAUD RATE 4

Specify the baud rate of I/O device corresponding with device number 4.

Data range : 8~13

5150	DEVICE NUMBER 5

Specify the specification number of I/O device corresponding to device number 5.

Data range : 1~4

5151	STOP BITS 5

Specify the number stop bits of I/O device corresponding with device number 5.

Data range : 1~2

5152	BAUD RATE 5

Specify the baud rate I/O device corresponding with device number 5.

Data range : 8~13

5160	DEVICE NUMBER 6

Specify the specification number of I/O device corresponding to device number 6.

Data range : 1~4

5161	STOP BITS 6

Specify the number of stop bits of I/O device corresponding with device number 6.

Data range : 1~2

5162	BAUD RATE 6

Specify the baud rate of I/O device corresponding with device number 6.

Data range : 8~13

	7	6	5	4	3	2	1	0
5200						POT	PCO	OUT (L)

POT 1: For G2.7 signal, converting the forbidden area is validated.
0: For G2.7 signal, converting the forbidden area is invalidated.

PCO 1 : Check soft over limit travel in advance before the movement.
0 : Do not check soft over limit travel in advance before the movement.

OUT 1 : Exterior is inhibited area for stored stroke limit 3.
0 : Interior is inhibited area for stored stroke limit 3.

	7	6	5	4	3	2	1	0
5210						OT1	OT3	OT2

OT1 1: STORED STROKE LIMIT 1 is not checked for each axis.
0: STORED STROKE LIMIT 1 is checked for each axis.

OT3 1 : Stored stroke limit 3 is checked for each axis.
0 : Stored stroke limit 3 is not checked for each axis.

OT2 1 : Stored stroke limit 2 is checked for each axis.
0 : Stored stroke limit 2 is not checked for each axis.

5220 STROKE LIMIT 1 VALUE ＋

Specify stored stroke limit 1 positive(+) direction coordinate value in machine coordinate system for each axis.

	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

Data range : -99999999~99999999

5221 STROKE LIMIT 1 VALUE －

Specify stored stroke limit 1 negative (-) direction coordinate value in machine coordinate system for each axis.

	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

Data range : -99999999~99999999

5222	STROKE LIMIT 2 VALUE +

Specify stored stroke limit 2 positive coordinate value in machine coordinate system for each axis

	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

Data range : -99999999~99999999

5223	STROKE LIMIT 2 VALUE −

Specify stored stroke limit 2 negative(-) direction coordinate value in machine coordinate system for each axis.

	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

Data range : -99999999~99999999

5224	STROKE LIMIT 3 VALUE +	(L)

Specify stored limit 3 positive(+) direction coordinate value in machine coordinate system for each axis.

	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

Data range : -99999999~99999999

5225	STROKE LIMIT 3 VALUE −	(L)

Specify stored stroke limit 3 negative (-) direction coordinate value in machine coordinate system for each axis.

	Increment			
	IS-A	IS-B	IS-C	Unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

Data range : -99999999~99999999

5226 STROKE LIMIT 1_2 VALUE +

If G2.7 is 1, set up the + direction coordinate values for the STORED STROKE LIMIT 1_2 for each axis.

	Setup Unit			
	IS-A	IS-B	IS-C	Unit
Linear axis	0.01	0.001	0.0001	Mm
Rotary axis	0.01	0.001	0.0001	Deg

Setup value: -99999999~99999999

5227 STROKE LIMIT 1_2 VALUE −

If G2.7 is 1, set up the - direction coordinate values for STORED STROKE LIMIT 1 for each axis.

	Setup Unit			
	IS-A	IS-B	IS-C	Unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis	0.01	0.001	0.0001	deg

Setup value: -99999999~99999999

5420 PITCH ERROR OF R POINT

Specify the pitch error compensation point number corresponding to reference point of each axis.

Data range : 0~639

5421 PITCH ERROR NEAREST −

Specify the pitch error compensation point number nearest the "-" end of each axis.

Data range : 0~639

5422 PITCH ERROR NEAREST +

Specify the pitch error compensation point number nearest the "+" end of each axis.

Data range : 0 ~ 639

	7	6	5	4	3	2	1	0
5603	PDC	P20 (L)	RPR	MDR	PDR	PP1	PP0	RSC

PDC 1 : Disconnection of position coder is not detected.

0 : Disconnection of position coder is detected.

P20 1 : Spindle position coder for lathe(for feed/rev.calc.) is 2000PPR type.

0 : Spindle position coder for lathe(for feed/rev.calc.) is 1024PPR type.

RPR 1 : When starting rigid tapping operation, spindle orientation is not performed first.

0 : When starting rigid tapping operation, spindle orientation is performed first

MDR 1 : When the analog speed command for spindle is +voltage, spindle turns CCW.

0 : When the analog speed command for spindle is +voltage, spindle turns CW. By changing this parameter from 0->1 for 1->0 the necessary spindle rotation direction for rigid tapping separation can be matched easily

PDR 1 : Spindle position coder pulse direction for CW spindle rotation is CCW.

0 : Spindle position coder pulse direction for CW spindle rotation is CW.

PP1, PP0 Select the right pulse per rotation Setting for the rigid tapping pos. Coder according the right table.

PP1	PP0	No. of pulse
0	0	256PPR
0	1	512PPR
1	0	1024PPR
1	1	2048PPR

RSC 1 : The constant surface speed control in rapid traverse(G00) is calculated based on the position at the end point of the block.

0 : The constant surface speed control in rapid traverse(G00) is calculated based on the current position of the tool.

	7	6	5	4	3	2	1	0
5605					AN2	AN1	IDM (L)	IOR (L)

AN2 1 : ANALOG output2(PNC2 #2)is valid

0 : ANALOG output2(PNC2 #2)is invalid

AN1 1 : ANALOG output1(PNC2 #1)is valid.

0 : ANALOG output1(PNC2 #1)is invalid.

IDM 1 : Positioning direction for spindle positioning M-code is minus.

0 : Positioning direction for spindle positioning M-code is plus.

IOR 1 : Spindle positioning mode is not cancelled by spindle pos. reset.

0 : Spindle positioning mode is cancelled by spindle pos. reset.

5614	SPINDLE GAIN ADJUSTMENT

Set the position loop gain for spindle and Z-axis at rigid tapping.

Data range : 0~4000 Unit : 0.01/SEC

5615	SPINDLE ORIENT SPEED

Set the position shift amount for spindle orientation at rigid tapping operation start.

Data range : 10~500 Unit : rpm

5616	SPINDLE RP SHIFT

Set the position shift amount for spindle orientation at rigid tapping operation start.

Data range : 0~4095 Unit : Detection Unit

5640	CONST SURFACE SPEED CTRL

Specify the axis number for the constant surface speed control.

Data range : 0~3

* If 0 is set, constant surface speed control is performed on the X axis.

5680	M SPINDLE ORIENTATION

Set M code for spindle orientation command.

Data range : 6~97

5681	M CANCEL POSITIONING

Specify the M-code number, which cancels the spindle orientation and establishes normal spindle speed control mode.

Data range : 6~97

5682	M SPINDLE POSITIONING BY M

Specify the initial M-code of the "spindle positioning by M-code" function. Thus 6 M-code will be established, starting with the M-code of parameter 5682, whereby the initial M-code brings about a spindle positioning of the basic rotation angle of parameter 5683 and the all calculated from the orientation 0-point.

Data range : 6~92

5683	BASIC ROTATION ANGLE

Specify the basic rotation angle for the "spindle positioning by M-code" function.

Data range : 1~60 Unit : DEG

5691	SRVO GAIN LOOP (GEAR1)

Set the spindle gain constant for rigid tapping Gain constant in the command voltage at 1000rpm spindle rotation.

EX) In case the command volta

ge for 6000rpm(max.)

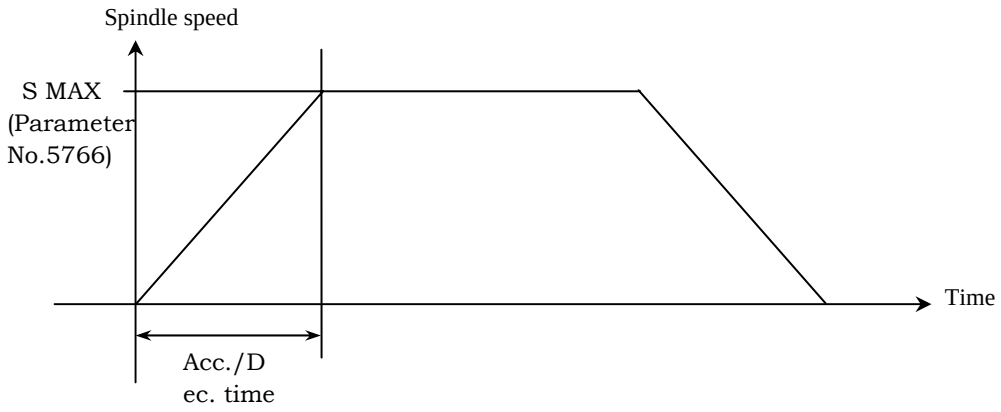
10 ×1000 / 6000 = 1666

Data range : 0~9999 Unit : mV

5692	SPIDLE GAIN LOOP (GEAR2)
5693	SPIDLE GAIN LOOP (GEAR3)
5694	SPIDLE GAIN LOOP (GEAR4)
5751	TIME CONSTANT (RIGID GR1)

Set the spindle and Z-axis acceleration/deceleration time for rigid tapping.

Data range : 10~1270 Unit : msec



5752	STOP POS ERR LIMIT

Set the allowable position error for spindle stop in rigid tapping mode. An alarm is issued when the position error amount exceeds this limit.

Data range : 10~4000 Unit : Detection unit standard setting : 500

5754	MOVING POS ERROR LIMIT

Set the allowable spindle moving position error for rigid tapping.

An alarm is issued and the spindle stops when the position amount exceeds that limit during rigid tapping.

The set value is calculated as below :

Set value = 1.2 ×s ×N ×4 / (G ×60)

Whereby S : max. spindle rpm during rigid tapping

N : No. of pulse per spindle rotation (before the NC calculates them internally times 4)

G : Spindle rotation loop gain.

Data range : 100~25000 Unit : Detection unit

5755	INPOSITION WIDTH

Set the imposition width of the spindle for rigid tapping. If the difference between spindle position and command position is smaller than the imposition width, the spindle is regarded as having reached the command position.

Data range : 0~127 Unit : Detection unit Standard setting : 20

5756	BACKLASH COMPEN

Set the spindle backlash compensation amount for rigid tapping.

Data range : 0~127 Unit : Detection unit

5757	M RIGID TAPPING

Specify the M-code that command rigid tapping mode.

Data range : 0~127 Standard setting : 29

5758	TAP RETURN RPM

Set rpm during rigid tapping return.

Setting value: 0~10000 Standard value : 0 (invalid)

5761	TIME CONSTANT (RIGID GR2)

Refer to 5751.

5762	TIME CONSTANT (RIGID GR3)

Refer to 5751.

5763	TIME CONSTANT (RIGID GR4)

Refer to 5751.

5766	S MAX SPEED (RIGID GR1)

Specify the maximum spindle – RPM for rigid tapping

Data range : 0~4000 Unit : RPM

5767	S MAX SPEED (RIGID GR2)

5768	S MAX SPEED (RIGID GR3)

5769	S MAX SPEED (RIGID GR4)

5770	MANUAL RIGID TAP LEAD (M)

Set up the manual RIGID TAPPING LEAD

Setup value: -32767~32767; Unit : 0.001mm

	7	6	5	4	3	2	1	0
6000	OFH (M)	LWM (L)	LD1 (L)	LVK	LXY (M)	PC1 (M)	PNH (M)	EVO

OFH 1 : “H” is used for tool radius offset.

0 : “D” is used for tool radius offset.

LWM Not used

LD1 1 : The tool offset number is specified by low order one digit of the T code.

0 : The tool offset number is specified by low order two digits of the T code.

LVK 1 : The tool offset vector is maintained without being cleared by reset.

0 : The tool offset vector is cleared by reset.

LXY 1 : The axis, where G43, G44 tool length offset applies can be freely assigned in the parts program.

0 : The axis, to where G43, G44 tool length offset applies, is always the Z-axis

PC1 1 : Tool offset(G45~G48) is valid for circular commands.

0 : Tool offset(G45~G48) is not valid for circular commands

PNH 1 : Tool offset(G45~G48) is commanded by “H” code.

0 : Tool offset(G45~G48) is commanded by “D” code.

EVO 1 : When the offset value is changed, the new offset value is effective from the next block which is loaded in buffer register.

0 : When the offset value is changed, the new offset value is effective from

6001

7	6	5	4	3	2	1	0
DRZ (M)	CNI	LGC (L)	LGN (L)	LWT (L)	LGT (L)	CNC	CSU

DRZ 1 : For dry run mode the data of parameter 6223 is added to the tool length offset amount(add. Offset shift function)

0 : For dry run mode the data of parameter 6223 is not added to the tool length offset amount(add. Offset shift function).

CNI 1 : Interference check is not performed for tool nose radius compensation.

0 : Interference check is performed for tool nose radius compensation.

LGC 1 : Both wear and geometry offsets are canceled when tool number 0 is specified with parameter LGN=0 (wear offset number and geometry offset number are common).

0 : Wear offset is canceled while geometry offset is not canceled when tool number 0 is specified with parameter LGN=0 (wear offset number and geometry offset number is common)

LGN 1 : Lower 2 or 1 digit of T code specifies wear offset number and tool number digit(s) (3^{rd} digit or 2^{nd} and higher digits of T code) specifies geometry offset number.

0 : Lower 2 or 2 digit of T code specifies geometry and wear offset numbers commonly.

LWT 1 : Tool wear offset is done by moving the tool.

0 : Tool wear offset is done by shifting work coordinate system.

LGT 1 : Tool geometry offset is done by moving the tool.

0 : Tool geometry offset is done by shifting work coordinate system.

CNC 1 : An alarm is not indicated when the programmed movement direction and the offset movement direction differ by 90 to 270 degree in tool nose R compensation(G41, G42).

0 : An alarm is indicated when the programmed movement direction and the offset movement direction differ by 90 to 270 degree in tool nose R compensation(G41, G42).

CSU 1 : B type is used for the start up type in tool nose R compensation(G41, G42)

0 : A type is used for the start up type in tool nose R compensation(G41,G42)

	7	6	5	4	3	2	1	0
6002	TMB (L)	OD2	OD1	OHS (L)	OFE	ORC (L)		K40

TMB 1 : B function is performed for direct input of measured tool offset(tool setter)

0 : A function is performed for direct input of measured tool offset(absolute).

OD2, OD1 : Specify the maximum number of the tool offset data.

OD2	OD1	No. of Data(L)	No. of Data(M)
0	0	32	32
0	1	64	99
1	0	94	200

OHS In case direct input of measured tool offset function B in used(TMB=1) :

1 : High speed skip signal is not used when B function is performed for direct measured tool offset(TMB=1).

0 : High speed skip signal is used when B function is performed for direct input of measured tool offset(TMB=1).

OFE 1 : The tool path at the graphic tool path display is shown without calculation of tool length offset(M) or tool position offset(L).

0 : The tool path at the graphic tool path display is shown including the calculation of tool length offset(M) or tool position offset(L).

ORC 1 : Tool offset value is specified by radius value.

0 : Tool offset value is specified by diameter value.

K40 1: Even if cutter compensation cancellation is commanded following circular interpolation, ALARM 121 will not be generated.

0: If cutter compensation cancellation is commanded following circular interpolation, ALARM 121 will be generated.

6015	TOUCH SENSOR ＋X (Xp)	(L)
6016	TOUCH SENSOR －X (Xm)	(L)
6017	TOUCH SENSOR ＋Z (Zp)	(L)
6018	TOUCH SENSOR －Z (Zm)	(L)

These parameters are referred to when B function is performed for direct input of measured tool offset. Specify the distance from the measurement standard point to the contact face of sensor. For the diameter designated axis, set in diameter value.

Increment system	IS-A	IS-B	IS-C	unit
METRIC unit	0.01	0.001	0.0001	mm
INCH unit	0.001	0.0001	0.00001	inch

Data range : -99999999~99999999

6019 TOOL LENGTH BIAS (M)

Specify the difference(bias amount) between tool and table surface for tool length offset input through the PLC I/F

Data range : -999999~999999 Standard setting : 0

6020 LASER ON INTERVAL (LASER SCRIBER)

Not used

6021 DRY RUN Z OFFSET

OFFSET amount for the OFFSET function of the Z axis during a DRY RUN

	Setup Unit			
	IS-A	IS-B	IS-C	Unit
mm type machine	0.01	0.001	0.0001	mm

Setup value: 0~ +99999999

6100 CLEARANCE 1 (LASER CUTTING)

Standard setting : 1000

6101 CREARANCE 2 (LASER CUTTING)

Standard setting : 2000

6102 CREARANCE 3 (LASER CUTTING)

Standard setting : 3000

Specify the value for nominal clearance 1,2,3 for the tracing function clearance 1,2 or 3 is selected by PLC-NC interface signals.

Data range : 0~32767 Standard unit : 0.001mm

6103 COMP. TIME 1 (LASER CUTTING)

Standard setting : 20

6104	COMP. TIME 2	(LASER CUTTING)

Standard setting : 20

Specify a “motor control offset time”, which will then be valid after the collision(=tracing) signal goes to high(=ON). Within this specified time the motor will no move. The motor elevates the axis only if the signal stays high longer than the specified time. Time 1 is valid when clearance 1 or 2 are selected, time 2 is valid when clearance 3 is selected.

Data range : 0~32767 Standard unit : msec

6105	THRESHOLD	(LASER CUTTING)

Specify the threshold value for output of the “position reached” signal.

Data range : 0~32767 Unit : 0.001mm Standard setting : 1000

6106	MEASURING RANGE	(LASER CUTTING)

Specify the distance between work and nozzle at which the sensor outputs exactly 10V

Data range : 0~32767 Unit : 0.001mm Standard setting : 10000

6110	GAIN P	(LASER CUTTING)

Set the proportional gain for tracing operation.

Data range : 0~32767 Standard setting : 500

6111	GAIN I	(LASER CUTTING)

Set the integral gain for tracing operating.

Data range : 0~32767 Standard setting : 0

6112	GAIN D	(LASER CUTTING)

Set the differential gain for tracing operating.

Data range : 0~32767 Standard setting : 0

6113	INPOSITION WIDTH CUT	(LASER CUTTING)

Establish the allowable in-position error value for the automatic edge showdown function.

Data range : 0~25000 Unit : Detection unit(PULSE)

	7	6	5	4	3	2	1	0
6115						TMD (C)	TRD (C)	TRE (C)

TMD 1: The TRACING function clearance display and Macro variable are assigned (#5840).
0: The TRACING function clearance display and Macro variable are not assigned (#5840).

TRD 1: The TRACING function Motor direction is inverted.
0: The TRACING function Motor direction is not inverted.

TRE 1: The TRACING function is valid.
0: The TRACING function is invalid.

6116	TRACING A/D INPUT NO	(for a LASER cutter)

Set up the channel number for the ANALOG input used in the TRACING function.
Parameter setup range for each axis: 0 ~ 127
If it is 0, the TRACING function is invalid.
If 1ch for RAD1 is used for the second axis, set the second axis to 1.
If two ANALOG inputs and n, m channels are used, set up the value for the n×10+m values.

6117	TRACING P GAIN	(for LASER cutter)

Set up the proportional GAIN for the TRACING function for each axis.
Setup range: 0 ~ 32767 setup

6120	CORNER ANGLE	(LASER CUTTING)

In C-axis tool direction control function, if the C-axis distance exceeds the setting value, tool moves up(M50) or down(M51).
Data range : 0 ~ 127 Unit : 1DEG

6121	ADVANCE	(LASER CUTTING)

Set tool width offset amount in C-axis tool direction control function.
Data range : 0 ~ 32767 Unit : 0.01mm

6122	OVERCUT	(LASER CUTTING)

Set overcut amount in C-axis tool direction control function.
Data range : 0 ~ 32767 Unit : 0.01mm

6123	CORNER ADVANCE	(LASER CUTTING)

In C-axis tool direction control function, set tool width offset amount if the tool moves up or down at the corner.
Data range : 0 ~ 32767 Unit : 0.01mm

6124	CORNER OVERCUT	(LASER CUTTING)

In C-axis tool direction control function, set overcut amount if the tool moves up or down at the corner.
Data range : 0 ~ 32767 Unit : 0.01mm

6125	MAX DISTANCE	(CLOTH CUTTING)

In cutter C-axis tool direction control function, set the maximum continuous cutting distance.
Data range : 0~32767 Unit : 0.01mm

6126	M17 LARGE ADVANCE	(CLOTH CUTTING)

In cutter C-axis tool direction control function, set advance amount during M17 large advance.
Data range : 0~32767 Unit : 0.01mm

6130	M02 REPEAT VALUE	(C)

Set repeated value by M02 code.
Data range : 0~99

6131	KERF VALUE	(C)

Set processing kerf width of gas cutter. (Specification B)
Data range : 0~100000 Unit : 0.001mm

6132	GAS CUTTING FEED	(C)

Set processing cutting speed of gas cutter. (Specification B)
Data range : 0~32767 Unit : mm/min

6133	FEED DOWN SIGNAL LEVEL	(C)

Set up the speed limit at which the gas cutter will output a signal that the cutting speed has dropped (Specification B).
Setup value: 0~25000 Unit: mm/min

6134	FEED DOWN LEVEL (1/100%)	(C)

Set up the speed limit at which the gas cutter will output the signal that cutting speed has dropped. The FEED DOWN signal (F153.6) is turned ON when parameter number 6133 is “0” and if 6134 contains a value by comparing the % for the assigned FEED.
Setup value: 0~10000 Unit: 1/100%

6154	SPINDLE ZERO OFFSET

Set zero offset of D/A converter for spindle.
Data range : -32767 ~ 32767

6170	ROUGH GRIND POWER	(G)

Set target grinding force for roughing. The maximum spindle grinding force should be set to 100%.
Data range : 1~100 Unit : 1 %

6171	FINISH GRIND POWER	(G)

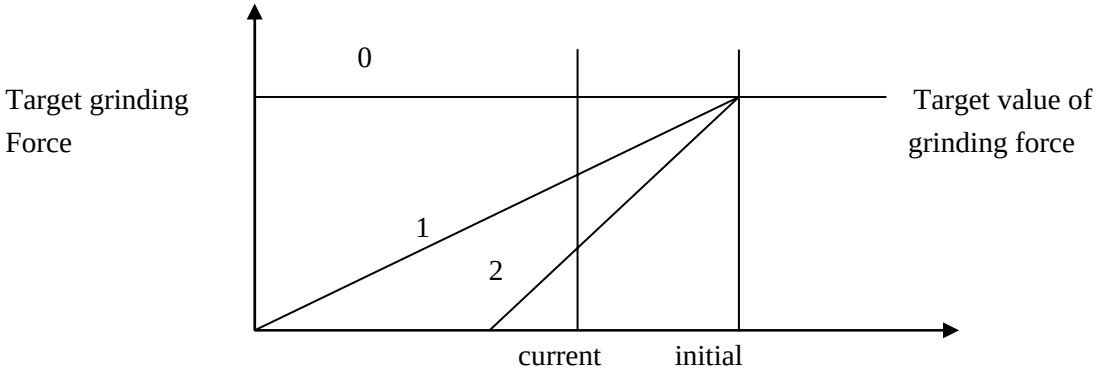
Set target grinding force for threading.
The maximum spindle grinding force should be set to 100%.
Data range : 1~100 Unit : 1 %

6172	GAIN KC	(G)

Set gain for finishing force control is set.
Data range : 0~32767

6173	COMPENSATION TYPE	(G)

Set compensation type of grinding stone. The maximum axis grinding force should be set to 100%
Data range : 0~2



6174	CONYTOL M CODE	(G)

Set the first number of the 4 M codes, which is used in finishing force control function.
Adding the above number to offset amount creates M code for each control function. There are no M flags from M code used in finishing force control function.
Data range : 0~127

6175	GRIND POWER DI	(G)

Set up the address of the Digital input for entering the grinding force used in finish grinding force control.
If the value is, the grinding force input for the usual specification is rendered valid.
Use analog input for EPS4 if 9010<ES4>=1.
If 9010<ES4>=0 and 9013<AD1>=1, use the analog input for CHI for RAD1.
Setup range: 0 ~ 499

6176	FULL POWER VOLTAGE	(G)

Voltage parameters for 100% grinding force (main axis load)
Setup range: 0 ~ 127 Unit: %

6177	POWER FILTER CONSTANT	(G)

Low Pass Filter for finish grinding force.
Setup range: 0 ~ 127 Unit: ms

	7	6	5	4	3	2	1	0
6200	V40 (M)		SRP		FCU	SIJ	DWL	FXY

V40 1 : Tool change for TNV-40 can be commanded by T-code alone.
0 : Tool change for TNV-40 cannot be commanded by T-code alone.

SRP 1: Shift is performed by rapid traverse.
0: Shift is not performed by rapid traverse.

FCU 1 : Rapid traverse in positioning mode(G00), or linear interpolation in the mode other than positioning mode(G01, G02, G03), is performed to move to the hole machining point in canned cycle.
0 : Always rapid traverse is performed to move to the hole maching point in canned cycle.

SIJ 1 : After spindle orientation, the tool retract direction and movement amount are specified by the program(I,J,K) in canned fine boring cycle and black boring cycle.
0 : After spindle orientation, the tool retract direction is set by a parameter #6240 and the movement amount is specified by program (Q) in canned fine boring cycle and black boring cycle.

DWL 1 : Dwell command by P is effective in canned tapping cycle.
0 : Dwell command by P is invalid in canned tapping cycle.

FXY 1 : Hole machining axis in canned cycle is selected by a program.
0 : Hole machining axis in canned cycle is always Z axis.

	7	6	5	4	3	2	1	0
6201							MN5	

MN5 1 : Among the boring canned cycles, M05 is not output before M19,M03 and M04 are output.
Applied G code : G74, G76, G84, G87
0 : Among the boring canned cycles, M05 is output before M19,M03 and M04 are output.
Applied G code : G74, G76, G84, G87

	7	6	5	4	3	2	1	0
6202	TPK	ABS	FCK		OAC		NRC (L)	MOR (L)

TPK 1:In automatic operation MODE, the design screen is maintained, with manual operation and handle operation selected.

0: In automatic operation MODE, the design screen is not maintained, with manual operation and handle operation selected.

ABS 1 : Graphic tool path is displayed according to absolute coordinates.

0 : Graphic tool path is displayed according to machine coordinates.

FCK 1 : Feed check function on the graphic screen enabled.

0 : Feed check function on the graphic screen disenabled.

OAC 1: Tool length offset(lath: tool position offset) during G28/G30 mode will be automatically cancelled.

0: Tool length offset(lath : tool position offset) during G28/G30 mode will cause “109 rpr in tool offset” alarm.

NRC 1 : Tool length offset

Finishing for the roughing is not performed at the end of roughing cycle (G71, G72).

0 : Finishing for the roughing is performed at the end of roughing cycle (G71,G72).

MOR 1 : Turning cycle is performed in a block where no movement command, during the canned turning cycle mode.

0 : Turning cycle is not performed in a block where no movement command, during the canned turning cycle mode.

	7	6	5	4	3	2	1	0
6203								

Not used

6205	SPEED COLORING MAX
6206	SPEED COLORING LEVEL

Not used

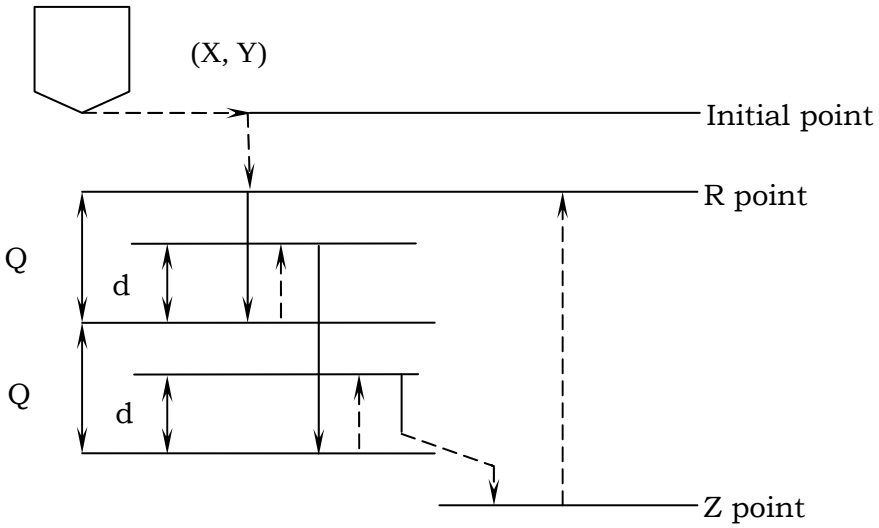
6210	RETURN AMOUNT G73

Specify the return amount in canned cycle G73.

Increment system	IS-A	IS-B	IS-C	Unit
METRIC unit	0.01	0.001	0.0001	mm
INCH unit	0.001	0.0001	0.00001	inch

Data range : 0~99999999

d : return amount



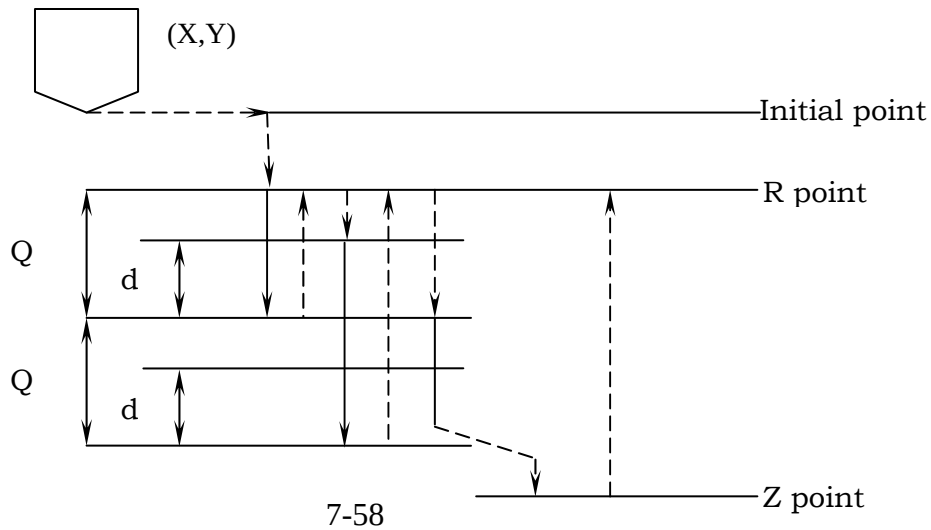
6211	CLEARANCE AMOUNT G83

Specify the clearance amount in canned cycle G83.

Increment system	IS-A	IS-B	IS-C	Unit
METRIC unit	0.01	0.001	0.0001	mm
INCH unit	0.001	0.0001	0.00001	inch

Data range : 0~99999999

d : clearance amount



6212	CHAMFERING AMOUNT	(L)

Specify the chamfering amount in the thread cutting cycle(G76,G92).

Data range : 0~127 Unit : 0.1 pitch

6213	CHAMFERING ANGLE	(L)

Specify the chamfering angle in the thread cutting cycle.

Data range : 0~60 Unit : 1 deg

6215	RETRACT AMOUNT G71 G72	(L)

Specify the retract amount in the roughing cycle (G71,G72).

Increment system	IS-A	IS-B	IS-C	unit
METRIC unit	0.01	0.001	0.0001	mm
INCH unit	0.001	0.0001	0.00001	inch

Data range : 0~32767

6216	CLEARANCE AMOUNT G71 G72	(L)

Specify the clearance amount in the roughing cycle(G71,G72)

Increment system	IS-A	IS-B	IS-C	Unit
METRIC unit	0.01	0.001	0.0001	mm
INCH unit	0.001	0.0001	0.00001	inch

Data range : 0~32767

6217	RETURN AMOUNT G74 G75	(L)

Specify the return amount in the peck drilling cycle (G74) or the grooving cycle. (G75).

Increment system	IS-A	IS-B	IS-C	Unit
METRIC unit	0.01	0.001	0.0001	mm
INCH unit	0.001	0.0001	0.00001	inch

Data range : 0~32767

6218	MINMUM INFEED G76	(L)

Specify the minimum infeed amount in the thread cutting cycle(G76).

When the infeed amount of one pass in the thread cutting cycle(G76) becomes smaller than the minimum infeed amount set by this parameter, the infeed amount is clamped at the minimum infeed amount.

Increment system	IS-A	IS-B	IS-C	Unit
METRIC unit	0.01	0.001	0.0001	mm
INCH unit	0.001	0.0001	0.00001	inch

Data range : 0~32767

6219	FINISH ALLOWANCE G76	(L)

Specify the finish allowance in the thread cutting cycle(G76)

Increment system	IS-A	IS-B	IS-C	Unit
METRIC unit	0.01	0.001	0.0001	mm
INCH unit	0.001	0.0001	0.00001	inch

Data range : 0~32767

6220	SPARK OUT G76	(L)

Specify the number of spark out cut in the thread cutting cycle.

Data range : 0~255

6221	DEPTH OF CUT G71 G72	(L)

Specify the depth of cut in the roughing cycle(G71,G72).

Data range : 1~99999999 (see “Data unit” of parameter #6219)

6222	RELIEF AMOUNT I G73	(L)

Specify the relief values in X axis direction in the cutting cycle(G73).

Data range : -99999999~99999999 (See “Data unit” of parameter #6219)

6223	RELIEF AMOUNT K G73	(L)

Specify the relief in Z axis direction in the cutting cycle(G73).

Data range : -99999999~99999999 (See “Data unit” of parameter #6219)

6224	NUMBER OF DIVISIONS G73	(L)

Specify the number of divisions in the cutting cycle(G73)

Data range : 1~99999999

6225	TOOL NOSE ANGLE G76	(L)

Specify the tool nose angle in the thread cutting cycle.

Data range : 0~120 unit : deg

6226	INPOSITION WIDTH Z AXIS	(M)

Specify the Z-axis inposition width to be applied after finishing one cycle of the canned drilling cycle as a condition to start positioning in the XY-plane for the next drilling cycle.

Data range : 0~25000 Standard setting : 1000

6240	TOOL RETRACT DIRECTION

Orientate the spindles of the canned cycle G76 (G86.1 for lathe system) and G87, and then set the axes and directions that the tool retracts. Or, correspond to each boring axis to set such axes and directions after the orientation. The set value is specified to axis number, while ± signs to direction.

Setting value : -8 ~ +8

Ex.) If X-axis is the boring axis, tool retracts in –Y direction after the spindle is oriented,

Y-axis is the boring axis, tool retracts in +Z direction after the spindle is oriented, and

Z-axis is the boring axis, tool retracts in –X direction after the spindle is oriented. Set as below.

(The first, second and third axis should be X, Y and Z respectively.)

For parameter of the first axis, –2 (the tool retracts in –Y direction.)

For parameter of the second axis, 3 (the tool retracts in +Z direction.)

For parameter of the third axis, –1 (the tool retracts in –X direction.)

In other than cases mentioned above, Set to 0.

6400

7	6	5	4	3	2	1	0
PDM	PBM	GLS	AB2	FD2	FPS	SCR (M)	RIN (M)

PDM 1 : Display pattern input screen in modes of zero return, manual operation or handle operation.

0 : Do not display pattern input screen in a mode of zero return, manual operation or handle operation.

PBM 1 : Use screen only for point boring. (From No. O6000 to O6999)

0 : Do not use screen only for point boring.

GLS 1 : Use screen only for glass scribing. (From No. O5000 to O5999)

0 : Do not use the screen only for glass scribing.

AB2 1 : Communicate with absolute encoder through COM2.

0 : Communicate with absolute encoder through COM1.

FD2 1 : RS232C No. 2 is used to connect the floppy disk unit.

0 : RS232C No.1 is used to connect the floppy disk unit.

FPS 1: There is no FILE extension for the USER FLOPPY DISK (O1234).

0: The FILE extension for the USER FLOPPY DISK is .nc (O1234.nc).

SCR 1 : The unit for the scaling factor is multiplied by 0.001

0 : The unit for the scaling factor is multiplied by 0.0001

RIN 1 : The angle command for coordinate system rotation(G68) is different for absolute(G90) and incremental(G91) command mode.

0 : The angle command(R) for coordinate system rotation(G68) is always an absolute one.

6401

7	6	5	4	3	2	1	0
ALY (C)	CPN (C)	ALF (C)	PDS	SAW	FDD	ASN	XSC (M)

ALF 1 : Alignment function. Set the first and second points as a point on Y-axis.
0 : Alignment function. Set the first and second points as a point on X-axis.

CPN 1 : Use pattern data for gas cutting.
0 : Do not use pattern data for gas cutting.

ALF 1 : Use alignment function for gas cutting.
0 : Do not use alignment function for gas cutting.

PDS 1 : Display pattern input screen with AUTO mode selected.
0 : Do not display pattern input screen with AUTO selected.

SAW 1 : Use screen only for the first axis running saw.
0 : Do not use screen only for the first axis running saw.

FDD 1 : The Floppy Disk Drive unit is used.
0 : The Floppy Disk Drive unit is not used.

ASN 1 : The automatic sequence No. geration function is valid.
0 : The automatic sequence No. geration function is not valid.

XSC 1 : Scaling factor is commanded with “I,J,K”.(Scaling and mirror image are valid for each axis.)
0 : Scaling factor is commanded with “P”

6402

7	6	5	4	3	2	1	0
RSD (C)	RTC (C)	TR2 (C)	EX9	EX8	ALC (C)	NSR	PPR

RSD 1: From the automatic operation program screen, gas cutting DATA is displayed on the right. The following must be satisfied prior to use: 2202 HCH=1, 6401 CPN=0.
0: From the automatic operation program screen, gas cutting DATA is not displayed on the right.

RTC 1: The path is indicated in advance on the design screen.
0: The path is not indicated in advance on the design screen.

RT2 1: From the design screen preview function, the compensating value for the path is rendered invalid.
0: From the design screen preview function, the compensating value for the path is rendered valid.

EX9 1: Hide the program after O9000 in the table.
0: Do not hide the program after O9000 in the table.

EX8 1: Hide the program after O8000 in the table.
0: Do not hide the program after O8000 in the table.

ALC 1: The Align function is rendered invalid.
0: The Align function is rendered valid.

NSR Function to RESTART from sequence number #699 for the macro variable #698 program

1: Rendered valid
0: Rendered invalid

PPR 1: The position return function is rendered valid.
0: The position return function is rendered invalid.

	7	6	5	4	3	2	1	0
6403	DDM	CSC	CRC (C)	BM4	PAC	SJ2	SJ1	J0S

DDM 1: From the disk, delete the CODE that cannot be displayed during NC program input.
0: From the disk, do not delete the CODE that cannot be displayed during NC program input.

CSC 1: The CHECK SUM function is rendered valid.
0: The CHECK SUM function s rendered invalid.

CRC 1: When entering a circular arc, cutter compensation is allowed.
0: When entering a circular arc, cutter compensation is not allowed.

BM4 1: In the illustrated table for the machining setup, display 4 figures in one screen.
0: In the illustrated table for the machining setup, display 16 figures in one screen.

PAC 1: For PLC axis setup, the PLC G ADDRESS has higher priority than the parameter.
0: For PLC axis setup, the parameter has higher priority than the PLC G ADDRESS.

SP2 1: For special diagnosis, carry out INTERRUPT diagnosis.
0: For special diagnosis, carry out reference point return diagnosis.

SP1 For special diagnosis

J0S 1: Display the “POS SET” menu on the manual operation position screen and make the corresponding 0SET valid.
0: Do not display the “POS SET” menu on the manual operation position screen.

	7	6	5	4	3	2	1	0
6404	PIO (PNC)	SWD	RTT	CGP	TPA (E)	AE3	AE2	AE1

PIO Reserved

RTT 1: The movement for the RETURN function is carried out in a straight line.
0: The movement for the RETURN function is carried out one axis at a time.

CGP 1: From the GAS cutter PATTERN A TYPE, PLC TIMER is used.]
0: From the GAS cutter PATTERN A TYPE, MACRO is used.]

TPA Reserved

AE3/AE2/AE1
Assign the ABSOLUTE ENCODER type (MAKER).
000: Use Panasonic.
001: Use YASKWA.

	7	6	5	4	3	2	1	0
6405	EFN	PTC	SWR	VAR	MSG	MNG	PAD	TPN

EFN 1: From the Program edit screen, the file operation function is used.
0: From the Program edit screen, the file operation function is not used.

PTC 1: From the Program edit screen, the partial copy function is used.
0: From the Program edit screen, the partial copy function is not used.

SVR 1: From the servo waveform, the ANALOG input voltage is used.
0: From the servo waveform, the ANALOG input voltage is not used.

VAR 1: From the servo waveform, the ANALOG input voltage is displayed/ expanded automatically.
0: From the servo waveform, the ANALOG input voltage is not displayed/ expanded automatically.

MSG 1: The machine state display function is rendered valid (RUNNING SAW).
0: The machine state display function is rendered invalid (RUNNING SAW).

MNG 1: Activate for the manager (RUNNING SAW).
0: Activate for the operator (RUNNING SAW).

PAD 1: The KeyPad display is used (RUNNING SAW).
0: The KeyPad display is not used (RUNNING SAW).

PTN 1: The TOUCH PANEL is used (RUNNING SAW).
0: The TOUCH PANEL is not used (RUNNING SAW).

	7	6	5	4	3	2	1	0
6406	USB	CPS				SWE	ADM	SPN

USB 1: The USB Memory Access Control Program Control MENU is displayed.
0: The USB Memory Access Control Program Control MENU is not displayed.

CPS: 1: Use the machining setup screen G-CODE generation function.
0: Do not use the machining setup screen G-CODE generation function.

SWE 1: From the Running Saw dedicated screen, the automatic operation mark is shaped like a panel.
0: From the Running Saw dedicated screen, the automatic operation mark is shaped like a machine.

ADM 1: Carry out Demo operation according to the File “DmyInput” content.
0: Do not carry out Demo operation.

SPN 1: Use the Special screen for the Touch Panel.
0: Do not use the Special screen for the Touch Panel.

	7	6	5	4	3	2	1	0
6407								

Not used

	7	6	5	4	3	2	1	0
6408								

Not used

	7	6	5	4	3	2	1	0
6409								

Not used

6410	MAGNIFICATIONS P G51	(M)

Specify the (G51) scaling factor P.

Data range : 1~99999999 Unit : 0.001 or 0.00001 according to parameter #6400, SCR

6411	ROTATION ANGLE R G68	(M)

Specify the rotation angle for G68 coordinate system rotation.

Data range : -360000~360000 Unit : 0.001 DEG

6421	MAGNIFICATIONS G51	(M)

Specify the rotation angle for G68 coordinate system rotation.

Data range : -999999~999999 Unit : 0.001 or 0.00001 according to parameter #6400, SCR

6500	TYPE OF SAVE DATA

From the function that saves the internal DATA (MACRO, DATATABLE, RELAY, and COUNTER) in a FILE when G257.0 is ON in SENTROL2, set up the DATA.

0 : No DATA to save
1 : Save the MACRO DATA.
2 : Save the DATATABLE.
3 : Save the RELAY.
4 : Save the COUNTER.

6501	NUMBER OF SAVE DATA

Set up the DATA number and Number of Bytes (for the PLC DATA) assigned by 6500.
MACRO DATA: MACRO number
DATATABLE, RELAY, COUNTER: Number of Bytes * 1000 + DATA number

6610	CORNER OVERRIDE MIN	(M)

Specify the minimum federate for deceleration(MDR) during inner circular cutting in automatic corner override mode.

Data range : 1~100 Unit : % Standard setting : 1

6611	CORNER OVERRIDE ANGLE	(M)

Specify the inner angle of the inside corner part for automatic corner override.

Data range : 1~89 Unit : 2 deg Standard setting : 46

6612	CORNER OVERRIDE VALUE	(M)

Deceleration ratio for automatic corner override at an inner corner part. Specify the override amount at inner corner.

Data range : 1~100 Unit : % Standard setting : 50

6613	CORNER OVERRIDE LE	(M)

End point of deceleration distance of automatic override at inner corner part.

Specify the operating range LE. Unit

Increment system	IS-A	IS-B	IS-C	Unit
METRIC unit	1	0.1	0.01	mm
INCH unit	0.1	0.01	0.001	inch

6614	CORNER OVERRIDE LS	(M)

Start point of deceleration distance of automatic override at inner corner part. Specify the operating range LS.

Data range : 1~4000 Unit : Refer to unit table of parameters 6613

6616	CIRCLE ERROR LIMIT	(M)

Establish the allowable radius error in circular motion cutting for automatic feed clamp calculation.

Data range : 1~4000

Increment system	IS-A	IS-B	IS-C	Unit
	0.01	0.001	0.0001	mm

6620	NO CUTTING SPEED OVERRIDE

Set to 0 or override speed for parts without cutting.

6820	AMOUNT / DIRCETION (G60)

Set the approach amount and direction for (G60) single direction position. Direction is decided according to the + or – sign of the data and the amount by the data itself.

	Increment			
	IS-A	IS-B	IS-C	Unit
Linear axis	0.01	0.001	0.0001	mm
Rotary axis.	0.01	0.001	0.0001	deg

Data range : -32767~32767

	7	6	5	4	3	2	1	0
6901						PCM		IGP

PCM 1: Output the signal by calculating the acceleration/deceleration and servo delay.
0: Output the signal without calculating the acceleration/deceleration and servo delay.

IGP 1: The POSITION SWITCH function is rendered valid.
0: The POSITION SWITCH function is rendered invalid.

6910	AXIS NUMBER OF POS SWITCH 1

Set up the POSITION SWITCH 1 target axis number.
If the setup value is 0, POSITION SWITCH 1 is rendered invalid.
Setup value: 0~8, 16 (maximum number of axes to control)

6911	AXIS NUMBER OF POS SWITCH 2
6912	AXIS NUMBER OF POS SWITCH 3
6913	AXIS NUMBER OF POS SWITCH 4
6914	AXIS NUMBER OF POS SWITCH 5
6915	AXIS NUMBER OF POS SWITCH 6
6916	AXIS NUMBER OF POS SWITCH 7
6917	AXIS NUMBER OF POS SWITCH 8
6918	AXIS NUMBER OF POS SWITCH 9
6919	AXIS NUMBER OF POS SWITCH 10
6920	AXIS NUMBER OF POS SWITCH 11
6921	AXIS NUMBER OF POS SWITCH 12
6922	AXIS NUMBER OF POS SWITCH 13
6923	AXIS NUMBER OF POS SWITCH 14

6924	AXIS NUMBER OF POS SWITCH 15
6925	AXIS NUMBER OF POS SWITCH 16
6930	MAXIMUM OF POS SWITCH 1

Set up the maximum value for the POSITION SWITCH 1 target axis setup range.
Setup value: -99999999 ~ 99999999

6931	MAXIMUM OF POS SWITCH 2
6932	MAXIMUM OF POS SWITCH 3
6933	MAXIMUM OF POS SWITCH 4
6934	MAXIMUM OF POS SWITCH 5
6935	MAXIMUM OF POS SWITCH 6
6936	MAXIMUM OF POS SWITCH 7
6937	MAXIMUM OF POS SWITCH 8
6938	MAXIMUM OF POS SWITCH 9
6939	MAXIMUM OF POS SWITCH 10
6940	MAXIMUM OF POS SWITCH 11
6941	MAXIMUM OF POS SWITCH 12
6942	MAXIMUM OF POS SWITCH 13
6943	MAXIMUM OF POS SWITCH 14
6944	MAXIMUM OF POS SWITCH 15
6945	MAXIMUM OF POS SWITCH 16

6950	MINIMUM OF POS SWITCH 1

Set up the minimum value for the POSITION SWITCH 1 target axis setup range.
Setup value: -99999999 ~ 99999999

6951	MINIMUM OF POS SWITCH 2
6952	MINIMUM OF POS SWITCH 3
6953	MINIMUM OF POS SWITCH 4
6954	MINIMUM OF POS SWITCH 5
6955	MINIMUM OF POS SWITCH 6
6956	MINIMUM OF POS SWITCH 7
6957	MINIMUM OF POS SWITCH 8
6958	MINIMUM OF POS SWITCH 9
6959	MINIMUM OF POS SWITCH 10
6960	MINIMUM OF POS SWITCH 11
6961	MINIMUM OF POS SWITCH 12
6962	MINIMUM OF POS SWITCH 13
6963	MINIMUM OF POS SWITCH 14
6964	MINIMUM OF POS SWITCH 15
6965	MINIMUM OF POS SWITCH 16

‘

	7	6	5	4	3	2	1	0
7000	PRT	MCM				BCS	SCS	TCS

PRT 1 : When outputting Dprint macro space, (blank) is output.
0 : When outputting Dprint macro space, (blank) is not output.

MCM 1 : At the program call by M-code method 09006-09009 are called by macro calls (parameter designation possible).
0 : At the program call by M-code method 09006-09009 are called by sub program calls.

BCS 1 : Custom macro (subprogram) is called by B code.
0 : Custom macro (subprogram) is not called by B code.

SCS 1 : Custom macro (subprogram) is called by S code.
0 : Custom macro (subprogram) is not called by S code.

TCS 1 : Custom macro (subprogram) is called by T code.
0 : Custom macro (subprogram) is not called by T code.

	7	6	5	4	3	2	1	0
7002				MIN	TSE	MPR	-	MUS

MIN 1 : Block end interrupt.
0 : Block stop interrupt.

TSE 1 : Status trigger.
0 : Edge trigger.

MPR 1 : Specify M code with macro interrupt ON/OFF.
0 : Use M96/M97.

MUS 1 : Macro interrupt is on.
0 : Macro Interrupt is off.

	7	6	5	4	3	2	1	0
7010	7	6	5	4	3	2	1	0

Not used.

	7	6	5	4	3	2	1	0
7011	7	6	5	4	3	2	1	0

Not used.

	7	6	5	4	3	2	1	0
7011	7	6	5	4	3	2	1	0

Not used.

	7	6	5	4	3	2	1	0
7012	#7	#6	#5	#4	#3	#2	#1	#0

Not used.

	7	6	5	4	3	2	1	0
7013	*7	*6	*5	*4	*3	*2	*1	*0

Not used.

	7	6	5	4	3	2	1	0
7014	=7	=6	=5	=4	=3	=2	=1	=0

Not used.

7033	MACRO INTERRUPT ON M CODE

M code number with macro interrupt ON

7034	MACRO INTERRUPT OFF M CODE

M code number with macro interrupt OFF

7050	G CALLING NO.9010

Specify the G codes to call the custom macros of program No.9010

Data range : -255~255

7051	G CALLING NO.9011

Specify the G codes to call the custom macros of program No.9011

Data range : -255~255

7052	G CALLING NO.9012

Specify the G codes to call the custom macros of program No.9012

Data range : -255~255

7053	G CALLING NO.9013

Specify the G codes to call the custom macros of program No.9013

Data range : -255~255

7054	G CALLING NO.9014

Specify the G codes to call the custom macros of program No.9014

Data range : -255~255

7055	G CALLING NO.9015

Specify the G codes to call the custom macros of program No.9015
Data range : -255~255

7056	G CALLING NO.9016

Specify the G codes to call the custom macros of program No.9016
Data range : -255~255

7057	G CALLING NO.9017

Specify the G codes to call the custom macros of program No.9017
Data range : -255~255

7058	G CALLING NO.9018

Specify the G codes to call the custom macros of program No.9018
Data range : -255~255

7059	G CALLING NO.9019

Specify the G codes to call the custom macros of program No.9019
Data range : -255~255

7071	M CALLING NO.9001

Specify the M codes to call the custom macros of program No.9001.
Data range : 0~9999

7072	M CALLING NO.9002

Specify the M codes to call the custom macros of program No.9002.
Data range : 0~9999

7073	M CALLING NO.9003

Specify the M codes to call the custom macros of program No.9003.
Data range : 0~9999

7074	M CALLING NO.9004

Specify the M codes to call the custom macros of program No.9004.
Data range : 0~9999

7075	M CALLING NO.9005

Specify the M codes to call the custom macros of program No.9005
Data range : 0~9999

7076	M CALLING NO.9006

Specify the M codes to call the custom macros of program No.9006
Data range : 0~9999

7077	M CALLING NO.9007

Specify the M codes to call the custom macros of program No.9007
Data range : 0~9999

7078	M CALLING NO.9008

Specify the M codes to call the custom macros of program No.9008
Data range : 0~9999

7079	M CALLING NO.9009

Specify the M codes to call the custom macros of program No.9009
Data range : 0~9999

7110	DRY RUN PROGRAM RESTART

Specify the axis order to move to the restart position in dry run at program restart.
Data range : 1~8
Note) For axis numbers please refer to parameter 1020.

	7	6	5	4	3	2	1	0
7200			SFP	HSS	DS4	DS3	DS2	DS1

SFP 1 : The feedrate of the skip function using high speed skip signal is set by parameter(#7211~#7214).
0 : The feedrate of the skip function using high speed skip signal is set by commanded F-code in program.
*This parameter set is valid only if HSS is set to “1”
*If high speed skip signal is not used but normal skip signal is used, refer to parameter #1400 SKF and #1428.

HSS 1 : High speed skip signal is used in skip function.
0 : High speed skip signal is not used in skip function.

DS1~DS4 : Set which skip signal is valid to dwell command of G04.

The signals and the bits match as follows.

1 : Skip signal is valid

0 : Skip signal is invalid

Conventional type skip signal	High speed skip signal	BIT name
SKIP1	SKIP	DS1
SKIP2	None	DS2
SKIP3	None	DS3
SKIP4	None	DS4

	7	6	5	4	3	2	1	0
7201	2S4	2S3	2S2	2S1	1S4	1S3	1S2	1S1

1S1~1S4 : Set which skip signal is valid to skip commands of G31 or G31.1

Set the value to 1 to make the signal valid

The skip signals and the bits match as follows.

Conventional type skip signal	High speed skip signal	BIT name
SKIP1	SKIP	1S1
SKIP2	None	1S2
SKIP3	None	1S3
SKIP4	None	1S4

2S1~2S4 : Set which skip signal is valid to skip commands of G31.2.

The skip signals and the bits match as follows.

Conventional type skip signal	High speed skip signal	BIT name
SKIP1	SKIP	2S1
SKIP2	None	2S2
SKIP3	None	2S3
SKIP4	None	2S4

	7	6	5	4	3	2	1	0
7202	4S4	4S3	4S2	4S1	3S4	3S3	3S2	3S1

3S1~3S4 : Set which skip signal is valid to skip commands of G31.3

Set the value to 1 to make the signal valid. The skip signals and the bits match as follow.

Conventional type skip signal	High speed skip signal	BIT name
SKIP1	SKIP	3S1
SKIP2	None	3S2
SKIP3	None	3S3
SKIP4	None	3S4

4S1~4S4 : Set which skip signal is valid to skip commands of G31.4.

The skip signals and the bits match as follows.

Conventional type skip signal	High speed skip signal	BIT name
SKIP1	SKIP	4S1
SKIP2	None	4S2
SKIP3	None	4S3
SKIP4	None	4S4

7211	FEEDRATE (G31. G31. 1)
7212	FEEDRATE (G31. 2)
7213	FEEDRATE (G31. 3)
7214	FEEDRATE (G31. 4)

Set skip function feeerate for each G code. These parameters are valid when the parameter #7200 SFP is set to “1”

	Increment system			
	IS-A	IS-B	IS-C	unit
Linear axis	10.0	1.0	0.1	mm/min.
Rotary axis	10.0	1.0	0.1	deg/min.

Data range : 0~32767

	7	6	5	4	3	2	1	0
7300							AMH	MDC

AMH 1 : High speed skip signal is used for automatic tool offset(G37).

0 : High speed skip signal is not used for automatic tool offset(G37).

MDC 1 : Add the tool measured amount to the current offset amount.

0 : Subtract the tool measured amount from the current offset amount.

7311	MEASUREMENT FEEDRATE 1

Set the measurement feedrate of tool measurement 1(G37.1)

7312	MEASUREMENT FEEDRATE 2

Set the measurement feedrate of tool measurement2(G37.2)

7313	MEASUREMENT FEEDRATE 3

Set the measurement feedrate of tool measurement 3(G37.3)

Increment system	IS-A	IS-B	IS-C	unit
Linear axis	10.0	1.0	0.1	mm/min

Data range : 1~6000

7321	GAMMA VALUE 1

Set the gamma value of tool measurement 1(G37.1)

7322	GAMMA VALUE 2

Set the gamma value of tool measurement 2(G37.2)

7323	GAMMA VALUE 3

Set the gamma value of tool measurement 3(G37.3)

Increment system	IS-A	IS-B	IS-C	unit
Linear axis(metric)	0.01	0.001	0.0001	mm
Linear axis(inch)	0.001	0.0001	0.00001	inch

Data range : -99999999~99999999

Note 1) X axis takes the radius value.

Note 2) Set the value larger than the epsilon value which is set to the parameter.

7331	EPSILON VALUE 1

Set the epsilon value of tool measurement 1(G37.1)

7332	EPSILON VALUE 2

Set the epsilon value of tool measurement 2(G37.2)

7333	EPSILON VALUE 3

Set the epsilon value of tool measurement 3(G37.3)

Increment system	IS-A	IS-B	IS-C	Unit
Linear axis(mm)	0.01	0.001	0.0001	mm
Linear axis(inch)	0.001	0.0001	0.00001	inch

Data range : -99999999~99999999

Note) X axis takes the radius value.

	7	6	5	4	3	2	1	0
7400		ABT	SNG	PAG	LTM	SIG	GS2	GS1

ABT 1 : An alarm is issued for tool change method A when the group of the return tool number is not the same as the group currently in use.

0 : No alarm is issued for tool change method A, even though the group of the return tool number is not the same as the group currently in use.

SNG 1 : The tool skip signal is accepted only while the tool life managed tool is in use.

0 : The tool skip signal is accepted for tools of the designated group on the group used before(refer to parameter 7400 “SIG”).

PAG 1 : All group execution data are cleared when the tool reset signal is input.

0 : Only the execution data of the group designated(from outside or through MDI) are cleared, when the tool reset signal is input.

LTM 1 : Tool life is specified by time

0 : Tool life is specified by frequency of tool use.

SIG 1 : At the time of tool skip signal input, the group No. is also entered.

0 : At the time of tool skip signal input, the current group is skipped. GS1, GS2 : Specify the number of registerable groups together with the number of tools per group according to the table below.

GS2	GS1	No. of groups	No. of tools/group
0	0	16	16
0	1	32	8
1	0	64	4
1	1	128	2

	7	6	5	4	3	2	1	0
7401							CT2 (M)	CT1 (M)

CT1, CR2 : Specify the tool change method for tool life monitoring according to the table below

CT2	CT1	Tool change method
0	0	A
0	1	B
1	0	C
1	1	D

7440	TOOL LIFE IGNORE 0 ~ 9999	(M)

Specify a number which will be substracted from any commanded tool number with a bigger value than this number, and the remaining value then becoming the tool group number in tool life management

Data range : 0~9999

7470	MASTER AXIS FOR SYNC	(M)

Determine to which axis synchronous control is performed if performing using synchronous control selection signals, SYNC1, SYNC2, SYNC3 and so on.

Set master number of axis where synchronous control is to be performed.

(Ex.) Display parameter under the following condition below.

1st axis --- X-axis

2nd axis --- Y-axis

3rd axis --- Z-axis

4th axis --- U-axis

5th axis --- W-axis

If synchronous control is performed with synchronous control selection signals SYNC4 and SYNC5, X-axis is synchronously controlled with U-axis, while Z-axis with W-axis.

Parameter 7470 master axis for sync.

X 0

Y 0

Z 0

U 1

W 3

Make sure to set 0 to parameters 1036 and 1037 if using parameter 7470.

	7	6	5	4	3	2	1	0
7480	-	-	TWT	TPN	TDC	PDC	TDA	PDA

TWT 1: The Twin Table control function is valid.
0: The Twin Table control function is invalid.

TPN 1: During synchronized operation, invert the sign for the feedback control amount based on the difference in Torque.
0: During synchronized operation, do not invert the sign for the feedback control amount based on the difference in Torque.

TDC 1: During synchronized operation, control to reduce the Torque difference between Master and Slave.
0: During synchronized operation, do not control to reduce the Torque difference between Master and Slave.

PDC 1: During synchronized operation, control to reduce the difference in the amount of position variation between Master and Slave.
0: During synchronized operation, do not control to reduce the difference in the amount of position variation between Master and Slave.

TDA 1: During synchronized operation, CHECK the difference in Torque between Master and Slave. If it exceeds the limit for Parameter 7486, display an ALARM.
0: During synchronized operation, do not CHECK the difference in Torque between Master and Slave.
This is valid for simple synchronized control as well.

PDA 1: During synchronized operation, CHECK the difference in the amount of position variation between Master and Slave. If it exceeds the limit for Parameter 7485, display an ALARM.
0: During synchronized operation, do not CHECK the difference in the amount of position variation between Master and Slave.
This is valid for simple synchronized control as well.

7481 SYNCRO POSITION ERR P GAIN

Position variation control proportional GAIN for each Slave axis
Setup range: 0 ~ 32767 GAIN 1 if the setup value is 256

7482 SYNCRO POSITION ERR I GAIN

Position variation control differential GAIN for each Slave axis
Setup range: 0 ~ 32767 GAIN 1 if the setup value is 256

7483 SYNCRO TORQUE P GAIN

Torque control proportional GAIN for each Slave axis
Setup range: 0 ~ 32767 GAIN 1 if the setup value is 256

7484 SYNCRO TORQUE I GAIN

Torque control differential GAIN for each Slave axis
Setup range: 0 ~ 32767 GAIN 1 if the setup value is 256

7485	SYNCRO POSITION ERR LIMIT

Position variation difference limit for each Slave axis
If the position variation difference for the synchronized axis exceeds the Setup Value, an ALARM will be generated.
If parameter 7480 <PDA> is 0, the threshold check is invalid.
Unit: Detection unit (pulse) Setup range: 0 ~ 32767

7486	SYNCRO TORQUE LIMIT

Torque difference limit for each Slave axis
If the Torque difference for the synchronized axis exceeds the Setup Value, an ALARM will be generated.
If parameter 7480 <TDA> is 0, the threshold check is invalid.
Unit: 4.88mV Setup range: 0 ~ 500

7487	SYNCRO TORQUE CHANGE

Set up the Torque value to reduce the Torque difference between each Slave axis.
If the difference between the Master and Slave axes exceeds the Setup Value, control to reduce the Torque.
Unit: 4.88mV Setup range: 0 ~ 1000

	7	6	5	4	3	2	1	0
7600				2A1				1A1

2A1 1 : High speed skip signal(SKIP) is valid to the G37.2 command.
0 : High speed skip signal(SKIP) is invalid to the G37.2 command.
1A1 1: High speed skip signal(SKIP) is valid to the G37.3 command.
0 : High speed skip signal(SKIP) is invalid to the G37.1 command

	7	6	5	4	3	2	1	0
7601								3A1

3A1 1 : High speed skip signal(SKIP) is valid to the G37.3 command
0 : High speed skip signal(SKIP) is invalid to the G37.3 command

	7	6	5	4	3	2	1	0
7603	OP7	OP6	OP5	OP4	OP3	OP2	OP1	OP0

OP7 1 : Feed override is commanded from(MOP) machine operators panel.
0 : Feed override is commanded from DKU (display & keyboard unit).

OP6 1 : MPG pulse multiplier is selected from MOP.
0 : MPG pulse multiplier is selected from DKU

OP5 1 : MPG move axis is selected from MOP
0 : MPG move axis is selected from DKU

OP4 1 : Jog feed or rapid traverse is selected from MOP
0 : Jog feed or rapid traverse is selected from DKU

OP3 1 : Rapid traverse rate is selected from MOP.
0 : Rapid traverse rate is selected form DKU

OP2 1 : Jog feedrate is selected from MOP
0 : Jog feedrate is selected form DKU

OP1 1 : Jog feed axis is selected from MOP
0 : Jog feed axis is selected from DKU

OP0 1 : Operating mode is selected from MOP
0 : Operating mode is selected from DKU

	7	6	5	4	3	2	1	0
7604	OPF		OPD	OPC			OP9	OP8

OPF Not used

OPD 1 : The cursor display will change immediately in case one of the protect key signals(G5.4~G5.7) changes.
0 : The cursor display will not change immediately in case one of the protect key signals (G5.4~G5.7) changes.

OPC 1 : The override cursors on the spindle speed screen are not displayed.
0 : The override cursors on the spindle speed screen are displayed.(override display follows the input at the PLC-NC signals G18.0-7)

OP9 1 : Software operators panel switches are not displayed in program display mode.
0 : Software operators panel switches are displayed in program display mode.

OP8 1 : Feed override cancel is commanded from machine operators panel.
0 : Feed override cancel is commanded from DKU (display & key board unit)

	7	6	5	4	3	2	1	0
8000	TAC	STF		BAK	PRT		NPA	

TAC 1: THERMAL ALARM CHECK is not carried out.
0: THERMAL ALARM CHECK is carried out.

STF 1 : Use step feed function in MPG mode.
0 : Do not use step feed function in MPG mode.

BAK 1 : Save data for parameter, pitch error and tool life to a file only once during startup.
0 : Save data for parameter, pitch error and tool life to a file on a periodic basis during startup.

PRT 1: The NC Program PROTECT function is rendered valid.
0: The NC Program PROTECT function is rendered invalid.

NPA 1: Even if an alarm is generated, the screen is not changed automatically to the alarm message display screen.
0: If an alarm is generated, the screen changes automatically to the alarm message display screen.

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	7	6	5	4	3	2	1	0
8002	RPC	WSM	CAP	BZ2	BUZ	TPE		ENG

RPC 1 : For the graphic scaling function rapid traverse movement is disregarded (only cutting path is regarded), when calculating the display area.
0 : For the graphic scaling function both, rapid traverse movement and cutting path, are regarded, when calculating the display area.

WSM 1 : Search or replace even if part correspondence is shown at the word beginning.
0 : Search or replace only if correspondence is shown over the whole words.

CAP 1 : The simple interactive graphic input function is fully valid.
0 : Only mune programming (without graphic support) is available.

BZ2 1 : Built-in BUZZER function valid(BUZZER CONTROL1 OFF).
0 : Built-in BUZZER function invalid(BUZZER CONTROL1 On).

TPE 1 : In reset state the toolpath display is cleared in auto mode.
0 : In reset state the toolpath display is not cleared in auto mode.

ENG 1 : English display.
0 : Korea display

8003							FND	MCL

FND 1: Actual Feed is not displayed.
0: Actual Feed is displayed.

MCL 1: In the machining setup screen, the “CLR” menu is displayed at the MACRO DATA input position.
0: In the process setup screen, the “CLR” menu is not displayed at the MACRO DATA input position.

	7	6	5	4	3	2	1	0
8004								

Not used

8005	DISPLAY LANGUAGE

Select the basic language.
0: Korean
1: Japanese
2: Chinese

	7	6	5	4	3	2	1	0
8010	EOF	PSM	BMP	BZH	SWM	HLP	MEF	MEN

EOF 1 : Do not recognize ‘ % ’ as the end of a file to display data after ‘ % ’.
0 : Recognize ‘ % ’ as the end of a file not to display data after ‘ % ’ .

PSM 1 : Use absolute coordinates for position data setting.
0 : Use relative coordinates for position data setting.

BMP 1: For the Illustrated Table function, display the table with a BITMAP.
0: For the Illustrated Table function, display the table with a program.

BZH 1 : Set buzzer frequency to 3000.
0 : Set buzzer frequency to 18000.

SWM 1 : Set on the right side of a wood figure machine.
0 : Set on the left side of a wood figure machine.

HLP 1 : Use parameter help function.
0 : Do not use parameter help function.

MEF 1 : Determine effective digit number of macro data.
0 : Do not determine effective digit number of macro data.

MEN 1 : Set effective digit number of macro data to 12.
0 : Set effective digit number of macro data to 8.

	7	6	5	4	3	2	1	0
8011	ST2	ST1	EAC	UBC	UMC	CLT	SMF	OPK

ST2 1 : Continues searching by scrolling from the end to the beginning or vice versa during search on the ladder screen.
0 : No scroll search is available during search on the ladder screen.

ST1 1 : Start from the beginning in case of the first search of address on the ladder screen.
0 : Start from the displayed position in case of the first search of address on the ladder screen.

EAC 1: During the movement of the assigned position due to the PLC, allow speed to be assigned for each axis.
0: During the movement of the assigned position due to the PLC, assign the same speed to all axes.

UBK 1 : Insert space between data devices on the processing setting screen.
0 : Do not insert space between data devices on the processing setting screen.

UMC 1 : Distinguish automatic mode from other modes on the processing setting screen.
0 : Do not distinguish automatic mode from other modes on the processing setting screen.

CLT 1 : Text calculation function become valid.
0 : Text calculation function become invalid.

SMF 1 : Display in a small font on the processing setting screen.
0 : Display in a big font on the processing setting screen.

OPK 1 : Extend keys used in parameters 2020 and 2021.
0 : Do not extend keys used in parameters 2020 and 2021.

	7	6	5	4	3	2	1	0
8012	AS1	AS0	RET	AMA	EPL	SCD	EAX	WNS

AS1 Position return coordinates system setup 2
AS0 Position return coordinates system setup 1

AS1	AS0	Assigned coordinate system
0	0	Machine coordinate system
0	1	Absolute coordinate system
1	0	Relative coordinate system
1	1	Relative coordinate system

RET 1 : Use automatic operation position return function.
0 : Do not use automatic operation position return function.

AMA 1: Allow movement of the assigned position due to the PLC in automatic operation as well (in the PLC axis).
0: Prohibit movement of the assigned position due to the PLC in automatic operation.

EPL 1 : PLC axis is excluded in display showing zero return of all axes is completed.

0 : PLC axis appears is included in display showing zero return of all axes is completed.

SCD 1 : Display the second auxiliary data value on the automatic operation program screen. (L/G)

0 : Do not display he second auxiliary data value on the automatic operation program screen. (L/G)

EAX 1 : E –axis is available.

0 : E-axis is unavailable.

WNS 1 : Do not regard program set in WORK NO. SEARCH function as selection program.

0 : Regard program set in WORK NO. SEARCH function as selection program.

8100 (i,PR)

7	6	5	4	3	2	1	0
CN7	CN6	CN5	CN4	CN3	CN2	CN1	CN0

CN0 1 : Accept file sending request.

0 : Do not accept file sending request.

CN1 1 : Accept file receiving request.

0 : Do not accept file receiving request.

CN2 1 : High speed directory transfer is valid.

0 : High speed directory transfer is invalid.

CN3 1 : High speed transfer for file sending request is valid.

0 : High speed transfer n for file sending request is invalid.

CN4 1 : High speed transfer for file receiving request is valid.

0 : High speed transfer for file receiving request is invalid.

CN5 1 : Attach comment to directory.

0 : Do not attach comment to directory.

CN6 1 : Directory update control is valid.

0 : Directory update control is invalid.

CN7 1 : Confirmation for remote operating data receiving is valid.

0 : Confirmation for remote operating data receiving is invalid.

8101 (i,PR)

7	6	5	4	3	2	1	0
CNF	CNE	CND	CNC	CNB	CNA	CN9	CN8

CNF Not Used

CNE Not Used

CND Not Used

CNC Not Used

CNB 1: During communication with the MITSUBISHI PLC, if the Write command fails, store the data in the buffer and send it later.

0: During communication with the MITSUBISHI PLC, if the Write command fails, gather and send the data again later.

CAN 1: During communication with the MITSUBISHI PLC, receive the response for the Read command and then send the Write command after processing the PLC inside the NC.

0: During communication with the MITSUBISHI PLC, receive the response for

the Read command and then send the Write command without processing the PLC inside the NC.

CNA Parameter for communication with MITSUBISHI PLC

CN9 1: During communication with the MITSUBISHI PLC, receive the data and then send the next command immediately.
0: During communication with the MITSUBISHI PLC, send the command first before processing the received data.

CN8 1: From the Network, process the received data immediately.
0: From the Network, process the received data one at a time.

8110	NETWORK MAX CONNECTION	(i,PR)

Set the maximum connection of N network.
Setting value: 1~100

8111	NETWORK RESPONSE DELAY	(i,PR)

Set network response delay.
Setting value: 0~10000 Setting unit: msec

8120	NET COMMAND REPEAT PERIOD	(i,PR)

Set network command repeat period.
Setting value: 1~10000 Setting unit: msec

8121	NET COMMAND REPEAT TIMES	(i,PR)

Set network command repeat times.
Setting value: 1~10

8122	DIR COMMAND REPEAT PERIOD	(i,PR)

Set directory command repeat period.
Setting value: 1~10000 Setting unit: msec

8123	DIR COMMAND REPEAT TIMES	(i,PR)

Set directory command repeat times.
Setting value: 1~10

8124	DIRECTORY PACKET SIZE	(i,PR)

Set directory packet size.
Setting value: 512~1024

8125	FILE COMMAND REPEAT PERIOD	(i,PR)

Set file sending/receiving command repeat period.
Setting value: 1~10000 Setting unit: msec

8126	FILE COMMAND REPEAT TIMES	(i,PR)

Set file sending/receiving command repeat times.
Setting value: 1~10

8127	FILE PACKET SIZE	(i,PR)

Set file sending/receiving packet size.
Setting value: 512~1024

8128	NUMBER OF FILE PACKETS	(i,PR)

Set the number of file sending/receiving packets.
Setting value: 1~10

	7	6	5	4	3	2	1	0	
8150	NB7	NB6	NB5	NB4	NB3	NB2	NB1	NB0	(i,PR)

NB7 1: Functions for handle axis and unit remote setting are valid.
0: Functions for handle axis and unit remote setting are invalid.
NB5 1: Remote operation start/stop/reset functions are valid.
0: Remote operation start/stop/reset functions are invalid.
NB2 1: Remote modification function for parameter is valid.
0: Remote modification function for parameter is invalid.
NB1 1: File sending/receiving function is valid.
0: File sending/receiving function is invalid.
NB0 1: Remote monitoring function is valid.
0: Remote monitoring function is invalid.

	7	6	5	4	3	2	1	0	
8151	NBF	NBE	NBD	NBC	NBB	NBA	NB9	NB8	(i,PR)

NBA 1: All files are receivable.
0: Only processing programs are receivable.
NB8 1: Remote override function is valid.
0: Remote override function is invalid.

	7	6	5	4	3	2	1	0	
8152									(i,PR)

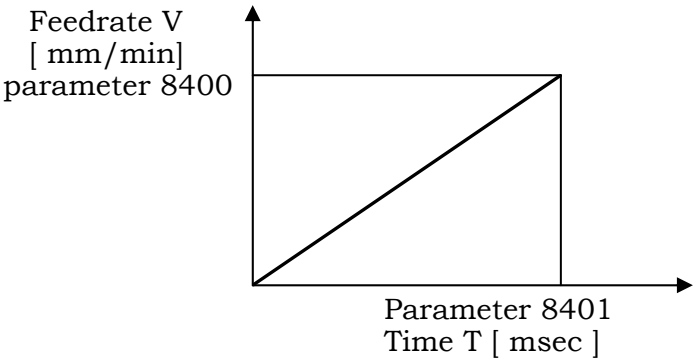
Not used.

8400	SPEED MAX (ABI)	(i)

Set the maximum parameter speed that determines linear positive (negative) acceleration prior to interpolation during high-speed precision processing.
Setting value: 0~32767 Setting unit: 10mm/min

8401	TIME CONSTANT (ABI)	(i)

Set the time for the maximum parameter speed that determines linear positive (negative) acceleration prior to interpolation during high-speed precision processing.
Setting value: 0~4000 Setting unit: msec



	7	6	5	4	3	2	1	0	
8402	OVP					DT2	DT1	DT0	(i)

OVP 1 : Overlap function is valid.
0 : Overlap function is invalid.
Bit6 1: The Maximum speed CLAMP is rendered invalid.
0: The Maximum speed CLAMP is rendered valid.
Bit4 1: From the Edge Stop Block, carry out the in-position Check.
0: From the Edge Stop Block, do not carry out the in-position Check.

Set distribution cycle using DT2, DT1 and DT0. The relationship between setting value and distribution cycle is shown below.
For SENTROL2, the standard distribution cycle is 8msec, but softwear option can be set to 4msec.

DT2	DT1	DT0	Dist. cycle	Block speed	Remarks
0	0	0	8msec	125block/sec	Standard setting
0	0	1	4msec	250block/sec	
0	1	0	2msec	500block/sec	Optional
0	1	1	1msec	1000block/sec	Optional
1	0	0	0.5msec	2000block/sec	Optional

	7	6	5	4	3	2	1	0	
8403		HS6		HS4	HS3	HS2	HS1	HS0	(i)

HS6 1: The acceleration CLAMP function is valid.
0: The acceleration CLAMP function is invalid.
HS4 1: The pre-deceleration function for the speed CLAMP is valid.
0: The pre-deceleration function for the speed CLAMP is invalid.
HS3 1: The speed CLAMP due to a SMALL BLOCK is valid.
0: The speed CLAMP due to a SMALL BLOCK is invalid.
HS2 1: The automatic Path Correction function is valid.
0: The automatic Path Correction function is invalid.
HS1 1: The ERASE SMALL BLOCK function is valid.
0: The ERASE SMALL BLOCK function is invalid.
HS0 1: BELL type acceleration/deceleration valid prior to interpolation
0: BELL type acceleration/deceleration invalid prior to interpolation

8404	TIME CONSTANT L (ABI)	(i)

For high-speed, high-precision processing, set up the time for the straight section of the time it takes to reach the maximum speed for the parameter that determines the acceleration for the BELL type acceleration/deceleration during interpolation.
Setup value: 0~4000 Unit: ms

8405	TIME CONSTANT S (ABI)	(i)

For high-speed, high-precision processing, set up the time for the curved section of the time it takes to reach the maximum speed for the parameter that determines the acceleration for the BELL-type acceleration/deceleration prior to interpolation.
Setup value: 0~4000 Unit: ms

	7	6	5	4	3	2	1	0	
8406									(i,PR)

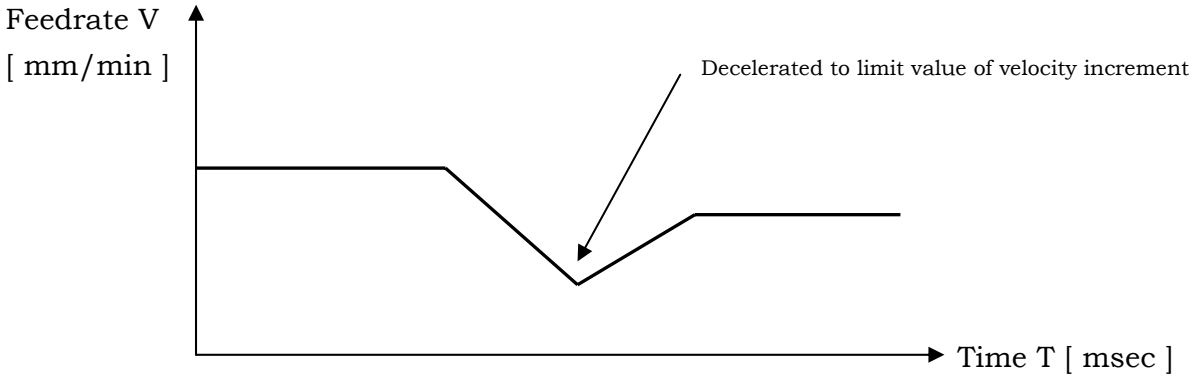
Not used

	7	6	5	4	3	2	1	0	
8407									(i,PR)

Not used

8410	CORNER VELOCITY DIFF	(i)

Set the limit value of corner velocity difference for each axis.
Setting value: 0~32767 Setting unit: mm/min



8411	TIME CONSTANT FOR MAX ACCEL	(i)

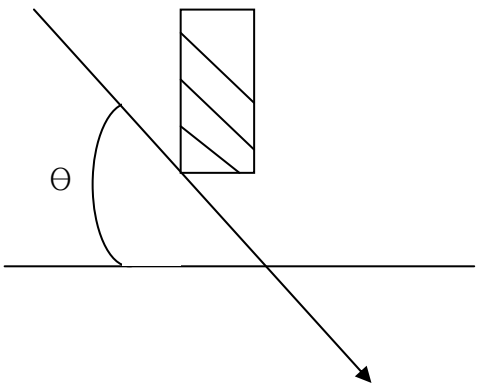
Number constant for allowable acceleration of each axis. Set the time to reach the maximum speed (parameter 1422).
Setting value: 0~32767 Setting unit: msec

8412	IGNORED VELOCITY FLUCTUATION	(i)

Set the ignored velocity fluctuation as ratio.
Setting value: 0~100 Setting unit: % Standard value: 10 %

8415	AREA2 OVERRIDE	(i)

Override value in area 2.
Setting value: 0~100 Setting unit: % Standard value : 80 %



AREA1 : 0° ≤ Θ< 30°
AREA2 : 30° ≤ Θ< 45°
AREA3 : 45° ≤ Θ< 60°
AREA4 : 60° ≤ Θ< 90°

8416	AREA3 OVERRIDE	(i)

Override value in area 3.
Setting value: 0~100 Setting unit: % Standard value : 70 %

8417	AREA4 OVERRIDE	(i)

Override value in area 4.
Setting value: 0~100 Setting unit: % Standard value : 60 %

8418	TIME CONSTANT (AAI)	(i)

Set the time constant for linear positive (negative) acceleration after interpolation in high-speed fixed processing mode (G61.1).
Valid if the parameter 1400 < LAI > equals 1.
Setting value: 0~100 Setting unit: msec Standard value : 8

8419	CORNER ANGLE	(i)

If the corner angle difference exceeds the value in high-speed precision processing mode, a machine is decelerated and then stopped.
Setting value: 0~90 Setting unit: DEG Standard value : 15

8420	CUTTING INPOSITION	(i)

Set the width for inposition check in case of 8402<INP>=1 if a machine is decelerated and then stopped in high-speed precision processing mode (G61.1).
Setting unit: detection unit (pulse) Setting range: 0~1000

8422	FEED FORWARD GAIN1	(i)

Set up the FEED FORWARD GAIN1 integer.
Setup value: 0~100

8423	FEED FORWARD GAIN2	(i)

Set up the FEED FORWARD GAIN2 number.
Setup value: 0~32767

8425	POSITION TOLERANCE	(i)

Set up the POSITION TOLERANCE integer.
Setup value: 0~10000

8426	TOLERANCE TO ERASE SMALL BLOCK	(i)

Set up the path tolerance to erase small blocks.
Setup value: 0~1000

8427	TOLERANCE FOR SMOOTHING	(i)

Set up the tolerance for automatic path correction.
Setup value: 0~1000

9000	PC DIAG. MAX DISP:X

From the PLC diagnosis screen, set up the maximum number that can be displayed for command “X.”
Setup value: 0~432

9001	PC DIAG. MAX DISP:Y

From the PLC diagnosis screen, set up the maximum number that can be displayed for command “Y.”
Setup value: 0~432

9002	PC DIAG. MAX DISP:R

From the PLC diagnosis screen, set up the maximum number that can be displayed for command “R.”
Setup value: 0~519

9003	PC DIAG. MAX DISP: D

From the PLC diagnosis screen, set up the maximum number that can be displayed for command “D.”
Setup value: 0~511

	7	6	5	4	3	2	1	0
9010	EP4	SPS			IO4	IO3	IO2	IO1

EP4 1: EPS4 RAD ANALOG input is used.
0: EPS4 RAD ANALOG input is not used.
SPS 1: The SPINDLE axis is not used.
0: The SPINDLE axis is used.
IO4 1: DIO3Board NO. 4 is installed.
0: DIO3Board NO. 4 is not installed.
IO3 1: DIO3Board NO. 3 is installed.
0: DIO3Board NO. 3 is not installed.
IO2 1: DIO3Board NO. 2 is installed.
0: DIO3Board NO. 2 is not installed.
IO1 1: DIO3Board NO. 1 is installed.
0: DIO3Board NO. 1 is not installed.

	7	6	5	4	3	2	1	0
9011						R12	R11	R1A

R12 1 : RIO1 printed board No.2 is mounted.
0 : RIO1 printed board No.2 is not mounted.
R11 1 : RIO1 printed board No.1 is mounted.
0 : RIO1 printed board No.1 is not mounted.
R1A 1 : RIO1printed board is automatically recognized.
0 : RIO1printed board is not automatically recognized.

	7	6	5	4	3	2	1	0
9012	R28	R27	R26	R25	R24	R23	R22	R21

R28 1 : RIO1 printed board No.8 is mounted.
0 : RIO1 printed board No.8 is not mounted.
R27 1 : RIO1 printed board No.7 is mounted.
0 : RIO1 printed board No.7 is not mounted.
R26 1 : RIO1 printed board No.6 is mounted.
0 : RIO1 printed board No.6 is not mounted.
R25 1 : RIO1 printed board No.5 is mounted.
0 : RIO1 printed board No.5 is not mounted.
R24 1 : RIO1 printed board No.4 is mounted.
0 : RIO1 printed board No.4 is not mounted.
R23 1 : RIO1 printed board No.3 is mounted.
0 : RIO1 printed board No.3 is not mounted.
R22 1 : RIO1 printed board No.2 is mounted.
0 : RIO1 printed board No.2 is not mounted.
R21 1 : RIO1 printed board No.1 is mounted.
0 : RIO1 printed board No.1 is not mounted.

	7	6	5	4	3	2	1	0
9013	AD8	AD7	AD6	AD5	AD4	AD3	AD2	AD1

AD8 1 : Use ALALOG voltage input CH8.
0 : Do not ALALOG voltage input CH8.
AD7 1 : Use ALALOG voltage input CH7.
0 : Do not ALALOG voltage input CH7.
AD6 1 : Use ALALOG voltage input CH6.
0 : Do not ALALOG voltage input CH6.
AD5 1 : Use ALALOG voltage input CH5.
0 : Do not ALALOG voltage input CH5.
AD4 1 : Use ALALOG voltage input CH4.
0 : Do not ALALOG voltage input CH4.
AD3 1 : Use ALALOG voltage input CH3.
0 : Do not ALALOG voltage input CH3.
AD2 1 : Use ALALOG voltage input CH2.
0 : Do not ALALOG voltage input CH2.

AD1 1 : Use ALALOG voltage input CH1.
0 : Do not ALALOG voltage input CH1.

	7	6	5	4	3	2	1	0
9014	GM7	GM6	GM5	GM4	GM3	GM2	GM1	GMA

GM7 1 : Mask F7 key menu for gas cutter.
0 : Do not mask F7 key menu for gas cutter.
GM6 1 : Mask F6 key menu for gas cutter.
0 : Do not mask F6 key menu for gas cutter.
GM5 1 : Mask F5 key menu for gas cutter.
0 : Do not mask F5 key menu for gas cutter.
GM4 1 : Mask F4 key menu for gas cutter.
0 : Do not F4 key menu for gas cutter.
GM3 1 : Mask F3 key menu for gas cutter.
0 : Do not F3 key menu for gas cutter.
GM2 1 : Mask F2 key menu for gas cutter.
0 : Do not F2 key menu for gas cutter.
GM1 1 : Mask F1 key menu for gas cutter.
0 : Do not F1 key menu for gas cutter.
GMA 1 : Mask all menus for gas cutter.
0 : Do not all menus for gas cutter.

	7	6	5	4	3	2	1	0
9015					R2C	R2B	R2A	R29

A parameter that allows up to 12 RIO2 Boards to be connected by mounting a third EPS3 board
R29 1: RIO2 Board NO. 9 is installed.
0: RIO2 Board NO. 9 is not installed.
R2A 1: RIO2 Board NO. 10 is installed.
0: RIO2 Board NO. 10 is not installed.
R2B 1: RIO2 Board NO.11 is installed.
0: RIO2 Board NO. 11 is not installed.
R2C 1: RIO2 Board NO. 12 is installed.
0: RIO2 Board NO. 12 is not installed.

	7	6	5	4	3	2	1	0
9016								WIP

WIP 1: AnyWire (UniWire) is used.
0: AnyWire (UniWire) is not used.

	7	6	5	4	3	2	1	0
9017	WA8	WA7	WA6	WA5	WA4	WA3	WA2	WA1

This is a parameter for measuring the voltage value from the servo waveform (may be used if mounted on a RAD board).

	7	6	5	4	3	2	1	0
9018								

reserve Parameter

	7	6	5	4	3	2	1	0
9090	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
9091	DBF	DBE	DBD	DBC	DBB	DBA	DB9	DB8
9092	DBN	DBM	DBL	DBK	DBJ	DBI	DBH	DBG
9093	DBW	DBU	DBT	DBS	DBR	DBQ	DBP	DBO
9094	DB*	DB/	DB-	DB+	DBZ	DBY	DBX	DBW
9095								

Parameter for development debug

9096	
9097	

Parameter for development debug

Chapter 8 Ordinary Repair

1. Repair Tools

The following measuring instruments are required to determine whether the power supplied to NC is appropriate and whether the wiring is appropriate:

(1) Measuring instruments

Measuring Instrument	Condition	Usage
AC voltmeter	Allowance of ±2% or less	Measures the AC power voltage
DC voltmeter	Maximum scale: 10V, 30V Allowance of ±2% or less	Measures the DC power voltage
OSCILLOSCOPE		General measurements and troubleshooting

(2) Tools

Cross-tip screwdriver ---------- Large, medium, small

Slotted screwdriver ---------- Medium, small

2. Air filter

The cabinet of the equipment uses SENTROL2 MAIN UNIT and has an air filter that needs to be cleaned periodically (once a week). This is because the efficiency decreases as the dust accumulates; this in turn increases the temperature inside the cabinet.

① Unscrew the bolt and remove the air filter.

② Remove dust from the filter.

③ Screw the filter back with the bolt.

3. Checkpoints Before Requesting for After-sales Service

Check the following first before requesting for after-sales service:

1) When?
   - Date and time of trouble.

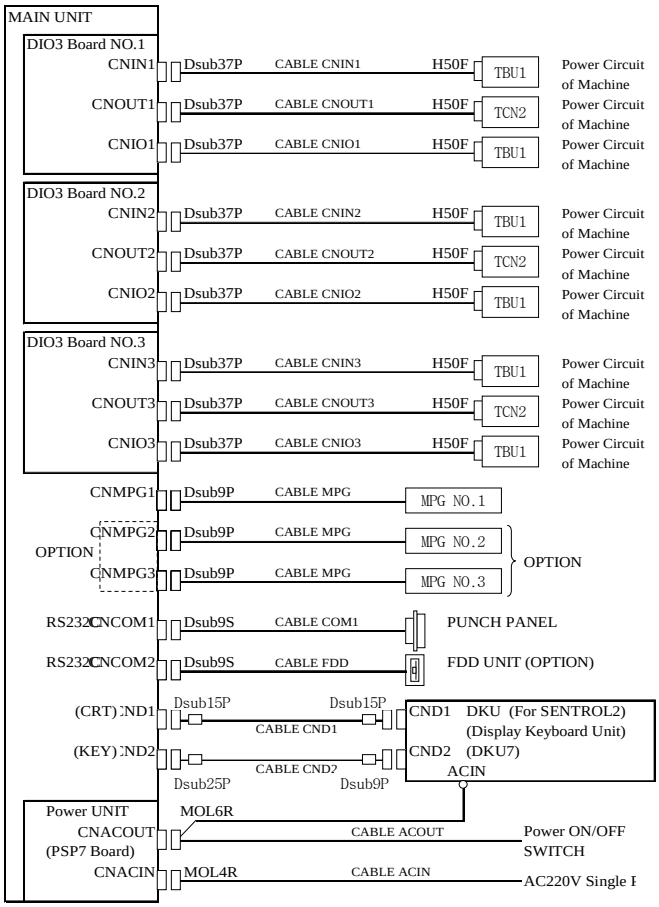
2) When was the trouble found?
   - What was the NC operation mode?
   - Information on the program number, contents, tool offset value, etc., in case of automatic operation
   - Position display value when the trouble occurred
   - Do other functions work properly?

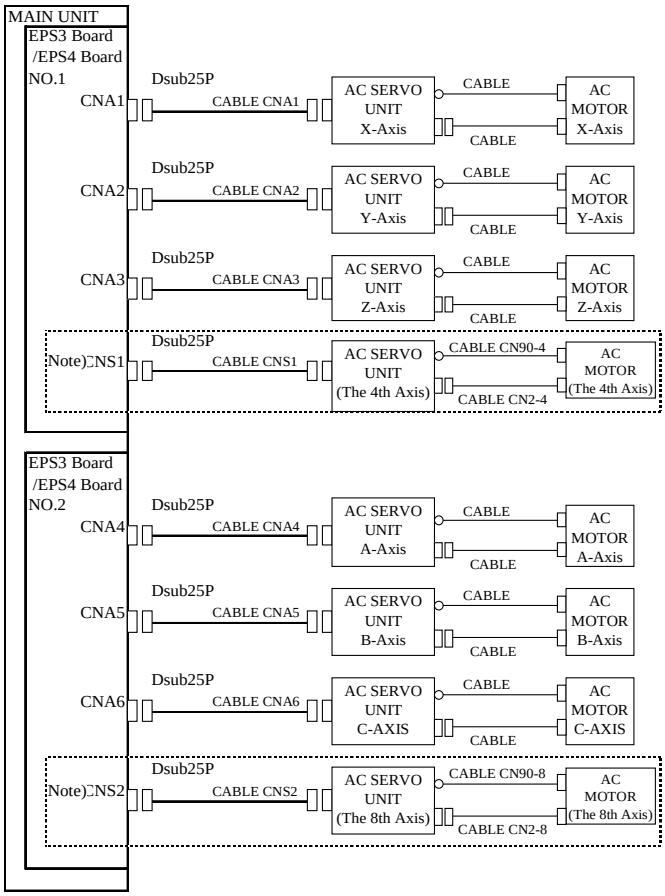
3) What type of trouble is it?
   - Alarm number
   - LED display on PCB
   - Display on SERVO UNIT and SPINDLE UNIT
   - Is the screen displayed normally?

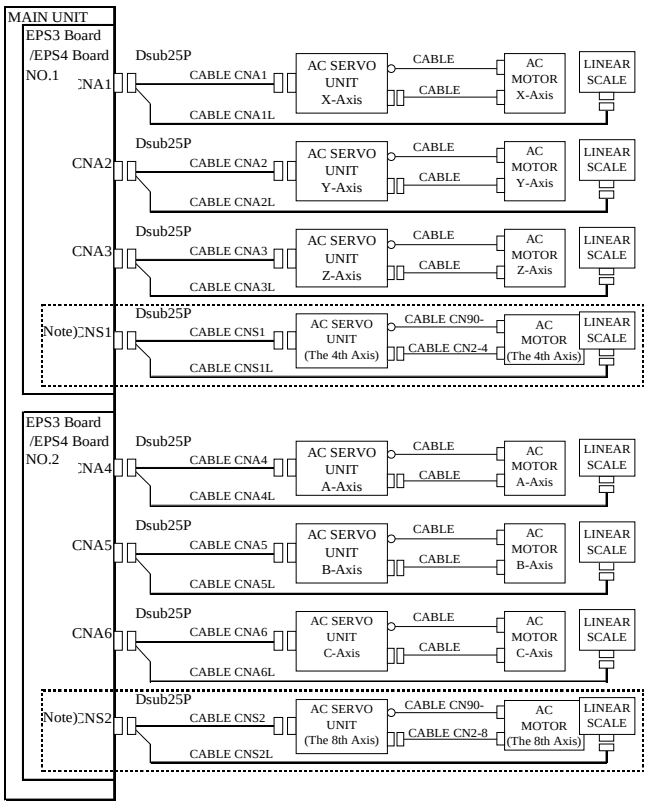
4) How often was the trouble found?
   - How often was the trouble found (every time or from time to time?)
   - Does the trouble occur when other machines are operated?
   - Are the power and voltage normal (does the voltage drop suddenly when other machines are operated?)?
   - Does the trouble occur during a specific operation?

Appendix

1. Basic Interface Connection







2. DIO3 Board I/O Signal List

CNIN1 Input Signal (DI) 32

1	COMMON 0	20	X0.0 *DEC1
2	X0.1 *HSKIP	21	X0.2 *DEC2
3	X0.3 *EMG	22	X0.4 *DEC3
4	X0.5 *ELS	23	X0.6 *DEC4
5	X0.7	24	COMMON 1
6	X1.0 *DEC5	25	X1.1
7	X1.2 *DEC6	26	X1.3
8	X1.4 *DEC7	27	X1.5
9	X1.6 *DEC8	28	X1.7
10	COMMON 2	29	X2.0 *DEC9
11	X2.1	30	X2.2 *DEC10
12	X2.3	31	X2.4 *DEC11
13	X2.5	32	X2.6 *DEC12
14	X2.7	33	COMMON 3
15	X3.0 *DEC13	34	X3.1
16	X3.2 *DEC14	35	X3.3
17	COMMON 4	36	X3.4 *DEC15
18	X3.5	37	X3.6 *DEC16
19	X3.7		

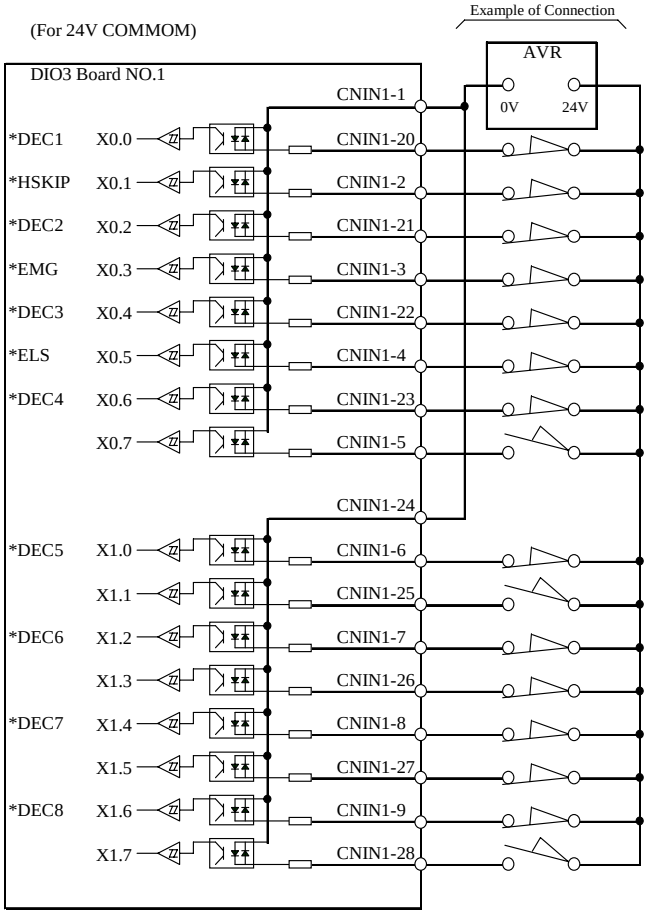
CNOUT1 Output Signal (DO) 32

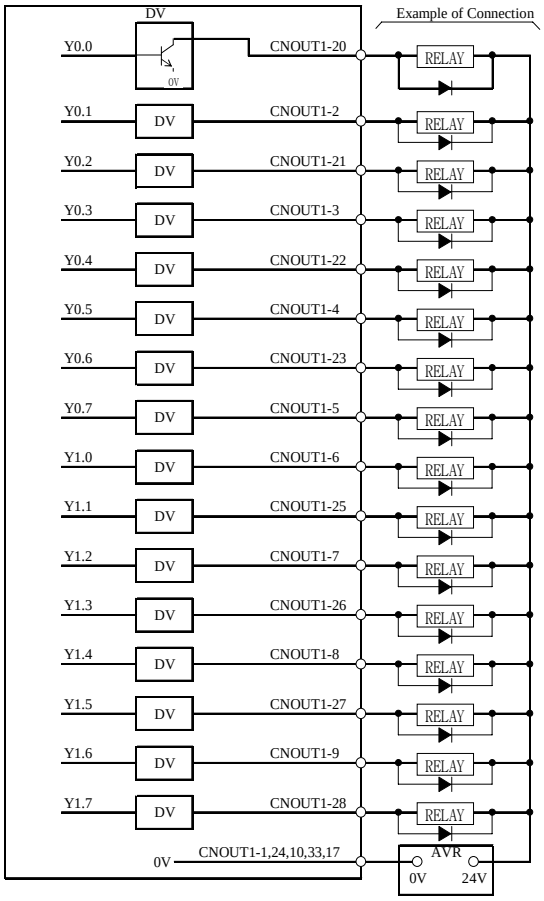
1	OV	20	Y0.0
2	Y0.1	21	Y0.2
3	Y0.3	22	Y0.4
4	Y0.5	23	Y0.6
5	Y0.7	24	0V
6	Y1.0	25	Y1.1
7	Y1.2	26	Y1.3
8	Y1.4	27	Y1.5
9	Y1.6	28	Y1.7
10	0V	29	Y2.0
11	Y2.1	30	Y2.2
12	Y2.3	31	Y2.4
13	Y2.5	32	Y2.6
14	Y2.7	33	0V
15	Y3.0	34	Y3.1
16	Y3.2	35	Y3.3
17	0V	36	Y3.4
18	Y3.5	37	Y3.6
19	Y3.7		

* EMG: Emergency Stop Signal * ELS : Emergency Stop Limit Switch Signal
* DEC1,2,3,4 ~ 16 : Speed Reduction Start Signal for Home F * HSKIP : Rapid Skip Signal
Note) *DEC signal and *HSKIP signal of the unused axis can be used arbitrarily.

CNIO1 Input Signal(DI)16 / Output Signal(DO)16

1	COMMON 0	20	X4.0
2	X4.1	21	X4.2
3	X4.3	22	X4.4
4	X4.5	23	X4.6
5	X4.7	24	COMMON 1
6	X114.0	25	X114.1
7	X114.2	26	X114.3
8	X114.4	27	X114.5
9	X114.6	28	X114.7
10	0V	29	Y4.0
11	Y4.1	30	Y4.2
12	Y4.3	31	Y4.4
13	Y4.5	32	Y4.6
14	Y4.7	33	0V
15	Y412.0	34	Y412.1
16	Y412.2	35	Y412.3
17	0V	36	Y412.4
18	Y412.5	37	Y412.6
19	Y412.7		





3. RIO1 Board I/O Signal List

RIO1 Board NO.1

OPCN3 OPERATOR'S PANEL Input Signal

1	LG	20	OPOUT03
2	OPOUT02	21	OPOUT01
3	OPOUT00	22	X103.7
4	X102.7	23	X101.7
5	X100.7	24	X103.6
6	X102.6	25	X101.6
7	X100.6	26	X103.5
8	X102.5	27	X101.5
9	X100.5	28	X103.4
10	X102.4	29	X101.4
11	X100.4	30	X103.3
12	X102.3	31	X101.3
13	X100.3	32	X103.2
14	X102.2	33	X101.2
15	X100.2	34	X103.1
16	X102.1	35	X101.1
17	X100.1	36	X103.0
18	X102.0	37	X101.0
19	X100.0		

OPCN4 OPERATOR'S PANEL Input Signal

1	LG	20	OPOUT07
2	OPOUT06	21	OPOUT05
3	OPOUT04	22	X107.7
4	X106.7	23	X105.7
5	X104.7	24	X107.6
6	X106.6	25	X105.6
7	X104.6	26	X107.5
8	X106.5	27	X105.5
9	X104.5	28	X107.4
10	X106.4	29	X105.4
11	X104.4	30	X107.3
12	X106.3	31	X105.3
13	X104.3	32	X107.2
14	X106.2	33	X105.2
15	X104.2	34	X107.1
16	X106.1	35	X105.1
17	X104.1	36	X107.0
18	X106.0	37	X105.0
19	X104.0		

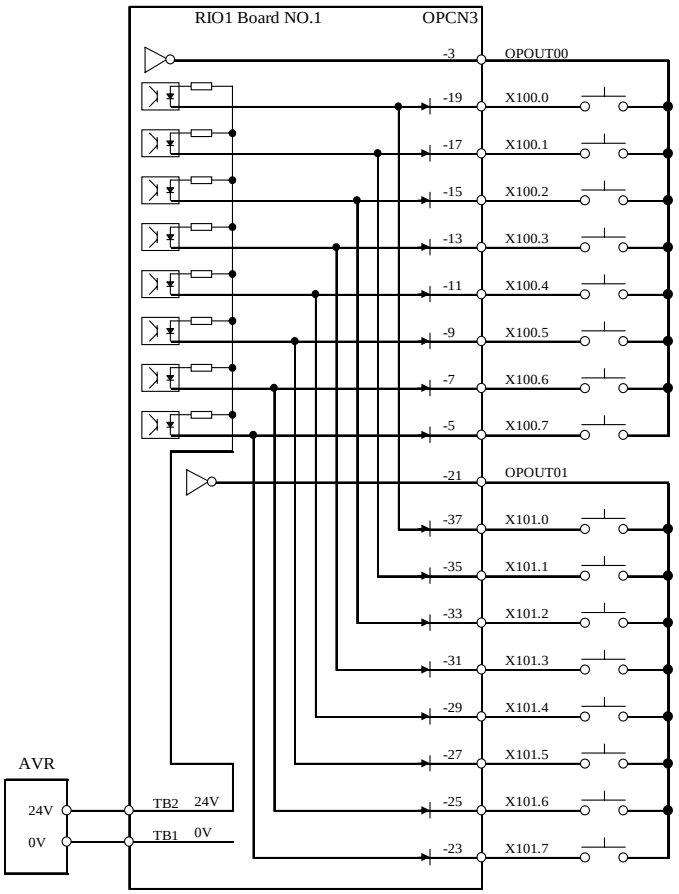
OPCN1 OPERATOR'S PANEL Output Signal

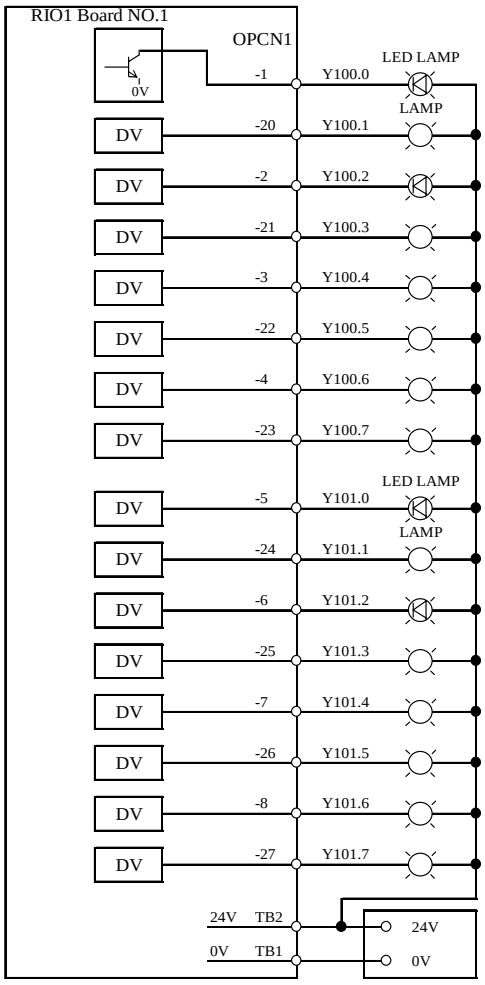
1	Y100.0	20	Y100.1
2	Y100.2	21	Y100.3
3	Y100.4	22	Y100.5
4	Y100.6	23	Y100.7
5	Y101.0	24	Y101.1
6	Y101.2	25	Y101.3
7	Y101.4	26	Y101.5
8	Y101.6	27	Y101.7
9	Y102.0	28	Y102.1
10	Y102.2	29	Y102.3
11	Y102.4	30	Y102.5
12	Y102.6	31	Y102.7
13	Y103.0	32	Y103.1
14	Y103.2	33	Y103.3
15	Y103.4	34	Y103.5
16	Y103.6	35	Y103.7
17	0V	36	0V
18	0V	37	0V
19	0V		

OPCN2 OPERATOR'S PANEL Output Signal

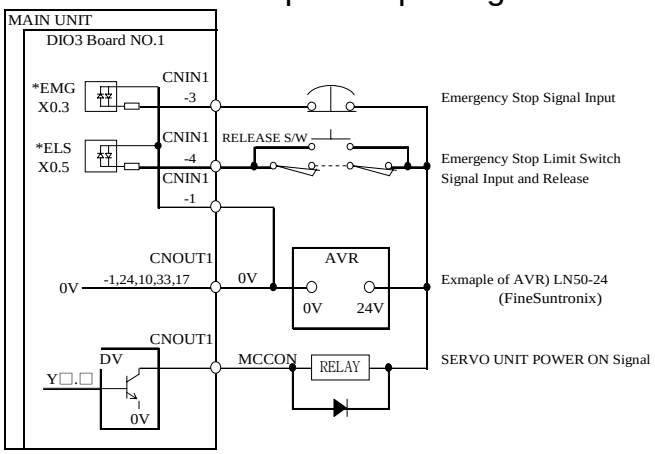
1	Y104.0	20	Y104.1
2	Y104.2	21	Y104.3
3	Y104.4	22	Y104.5
4	Y104.6	23	Y104.7
5	Y105.0	24	Y105.1
6	Y105.2	25	Y105.3
7	Y105.4	26	Y105.5
8	Y105.6	27	Y105.7
9	Y106.0	28	Y106.1
10	Y106.2	29	Y106.3
11	Y106.4	30	Y106.5
12	Y106.6	31	Y106.7
13	Y107.0	32	Y107.1
14	Y107.2	33	Y107.3
15	Y107.4	34	Y107.5
16	Y107.6	35	Y107.7
17	0V	36	0V
18	0V	37	0V
19	0V		

OPCN1 Dsub37P　OPCN2 Dsub37P　OPCN3 Dsub37P　OPCN4 Dsub37P

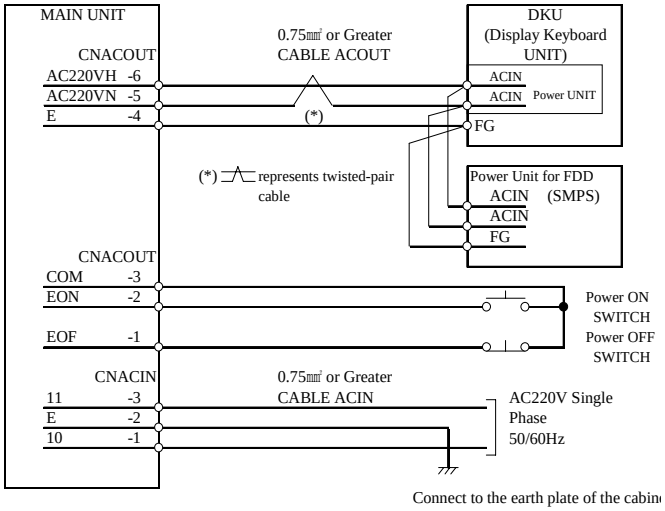




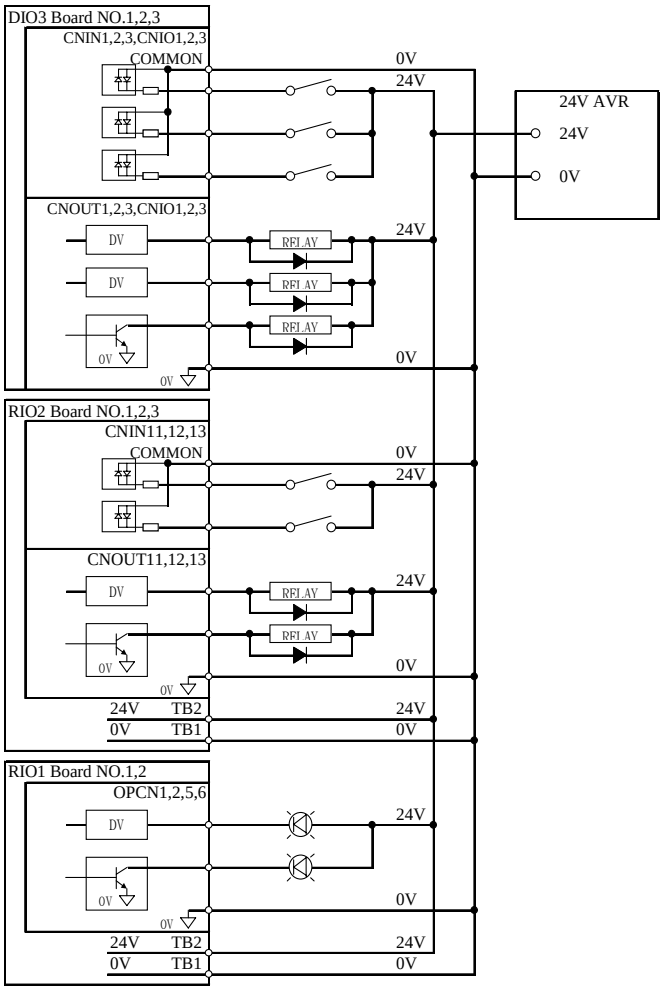
4. Other Input/Output Signals



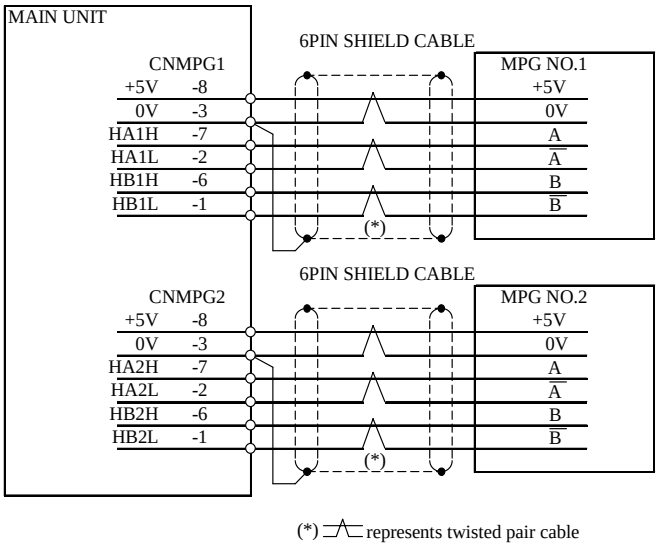
5. Connection of AC Power



6. Connection of 24V Power



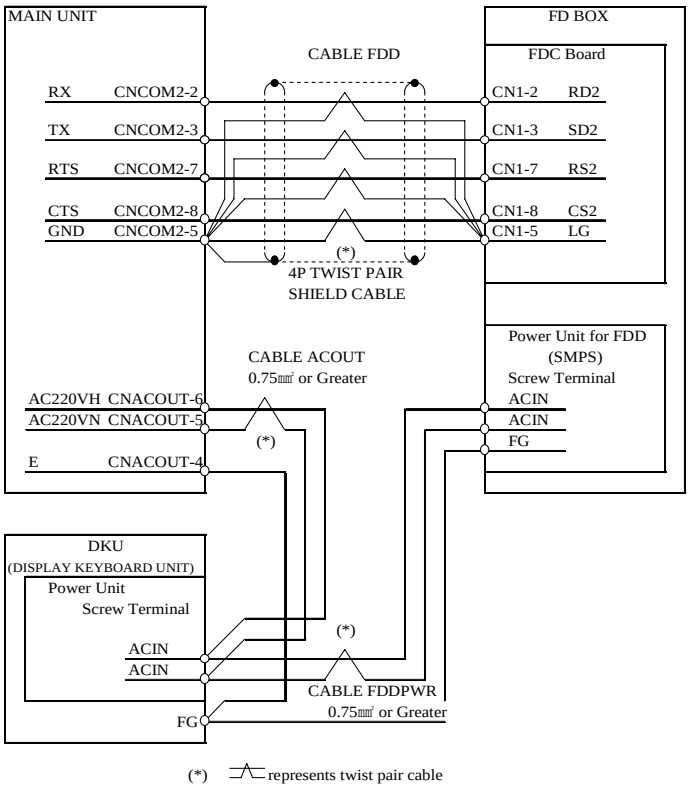
7. Connection of MPG



(*) represents twisted pair cable

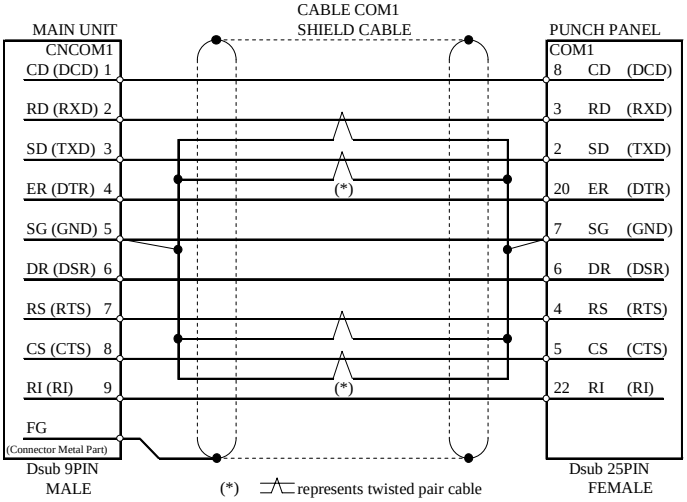
Note) Connect MPG NO.3 to CNMPG3. Wiring is the same as NO.1,2.

8. FDD Connection

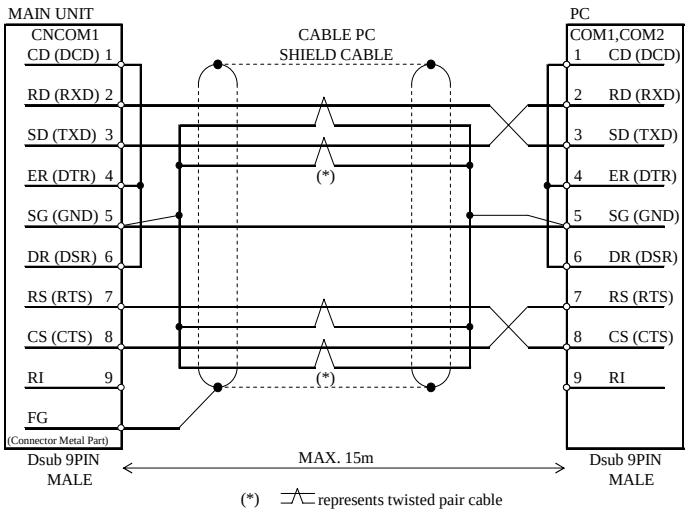


9. RS232C INTERFACE

Connecting to punch panel

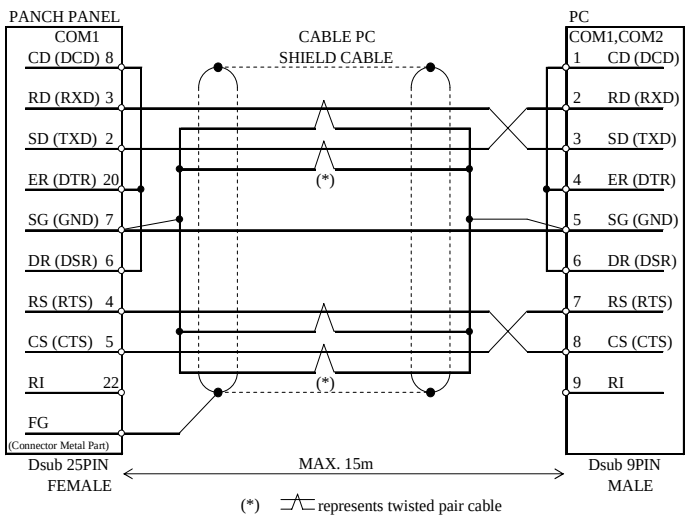


Direct Connection to PC



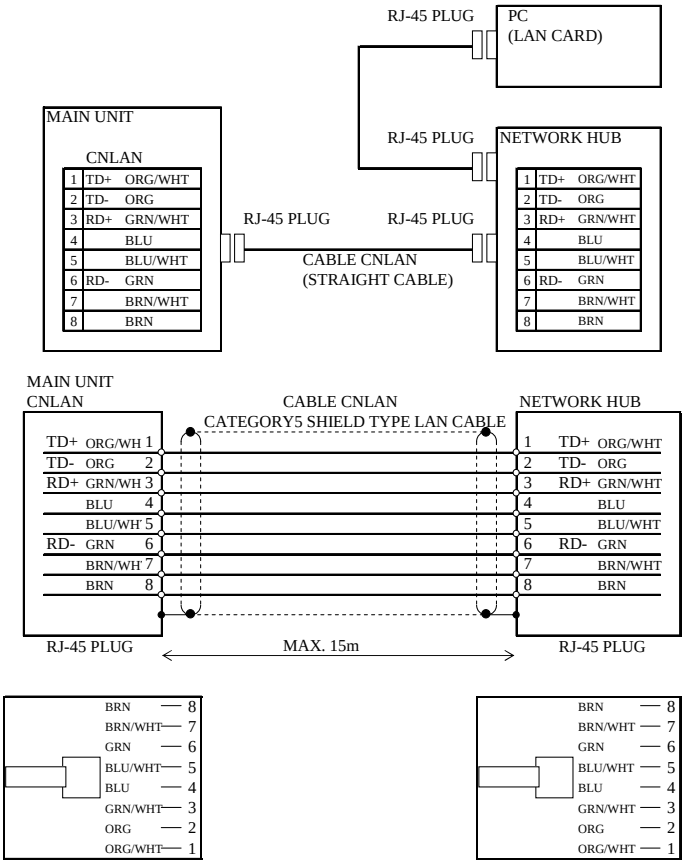
Note) In case the cable length is 10m or greater, or in DNC operation,
make a twisted pair with signal cable (RD,SD,RS,CS) and ground cable (SG,GND).

Connect to PC through Punch Panel

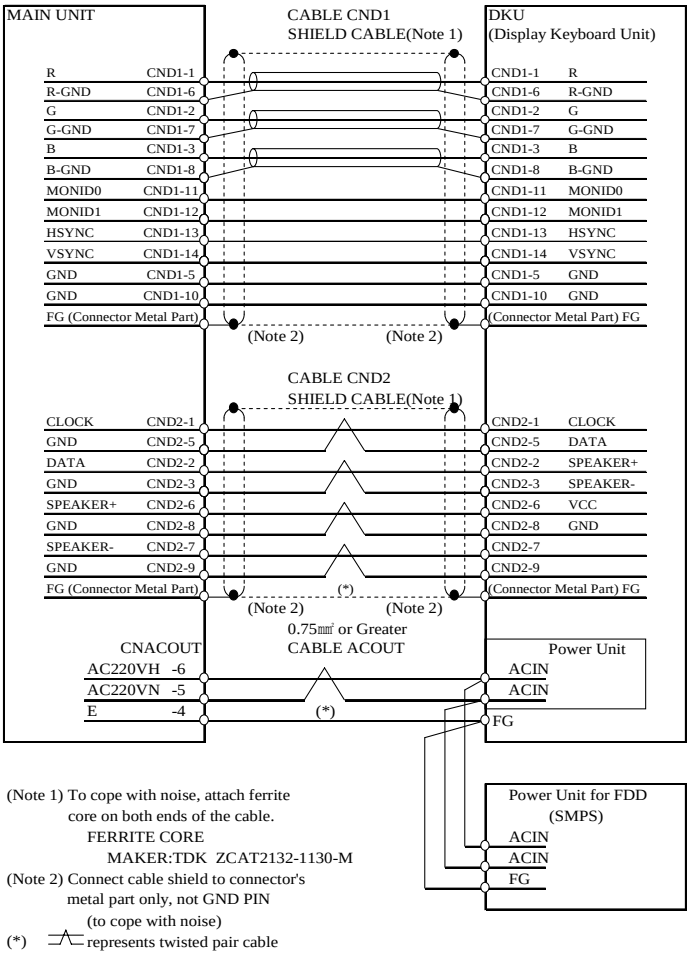


Note) In case the cable length is 10m or greater, or in DNC operation,
make a twisted pair with signal cable (RD,SD,RS,CS) and ground cable (SG,GND).

10. LAN INTERFACE

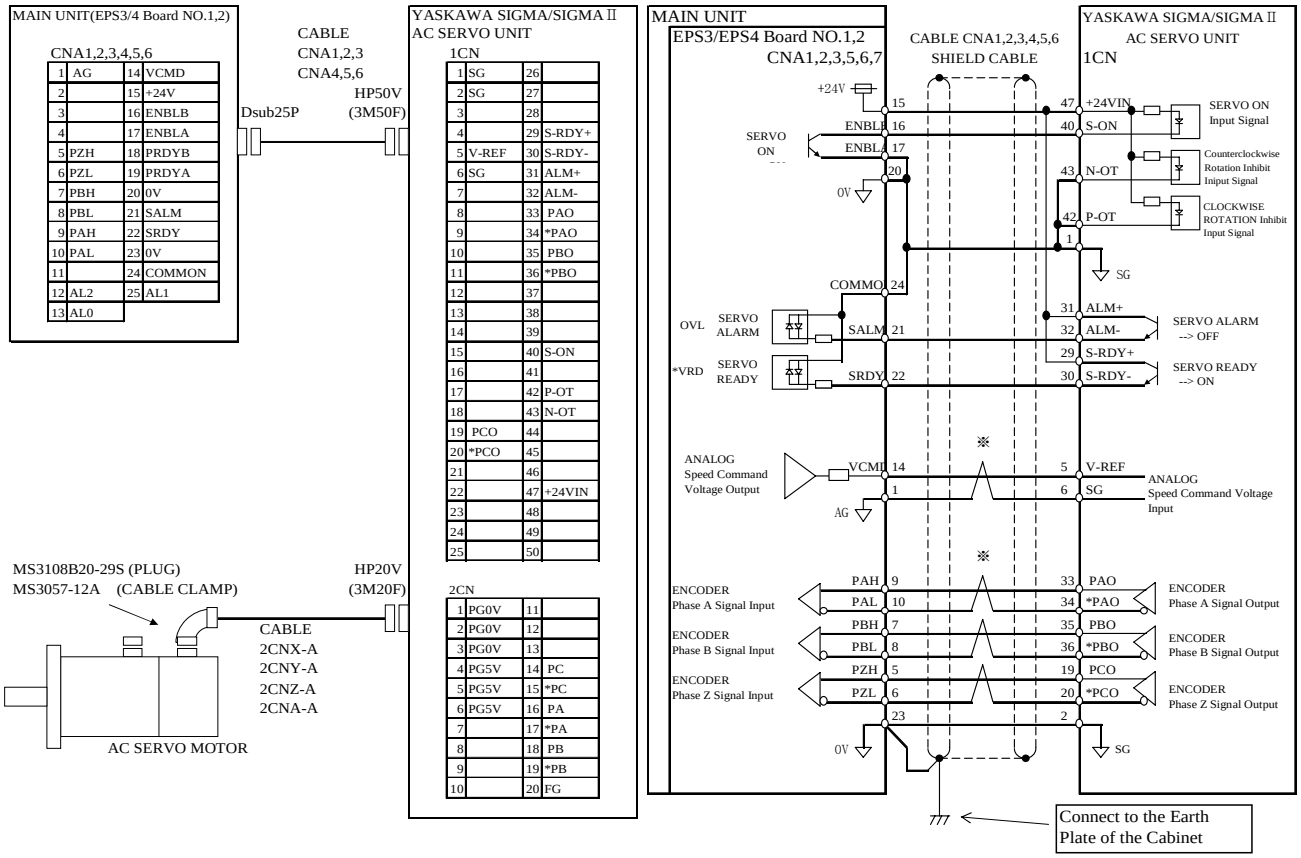


11. Connection to SENTROL2 MAIN UNIT and DKU



12. Connecting to SENTROL2 and AC SERVO

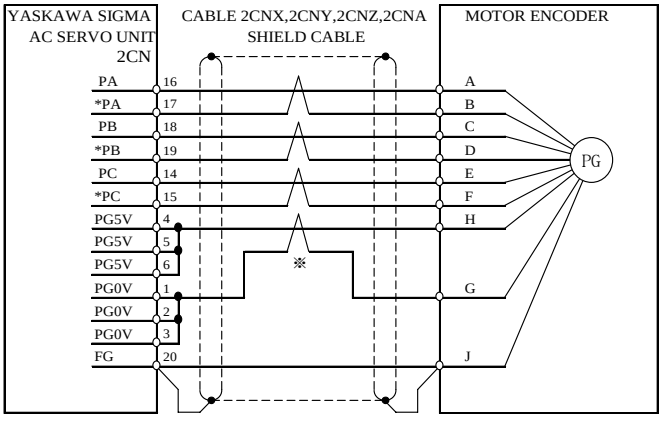
12.1 Connecting to YASKAWA SIGMA/SIGMA II SERIES AC SERVO



1	AG	14	VCMD
2		15	+24V
3		16	ENBLB
4		17	ENBLA
5	PZH	18	PRDYB
6	PZL	19	PRDYA
7	PBH	20	0V
8	PBL	21	SALM
9	PAH	22	SRDY
10	PAL	23	0V
11		24	COMMON
12	AL2	25	AL1
13	AL0		

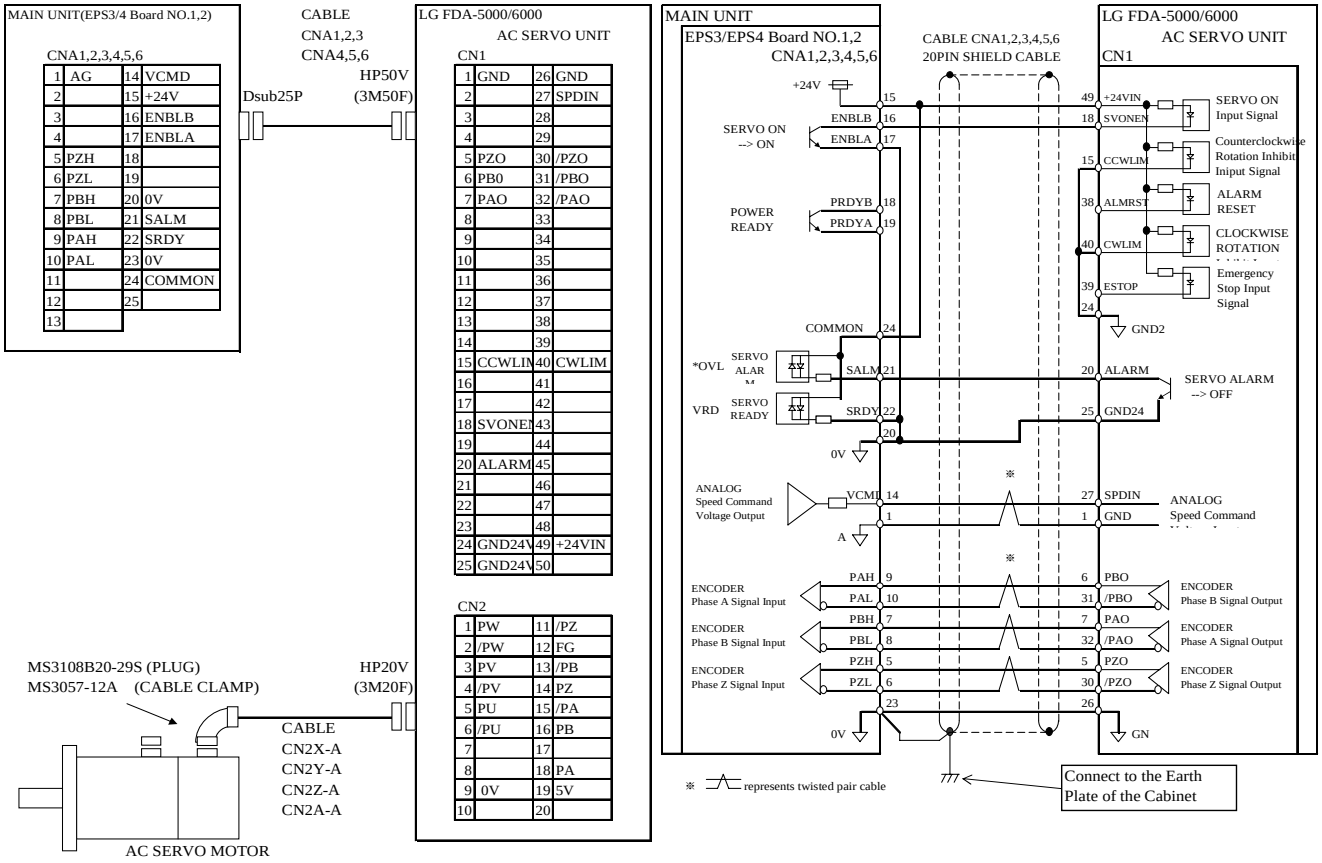
1	SG	26	
2	SG	27	
3		28	
4		29	S-RDY+
5	V-REF	30	S-RDY-
6	SG	31	ALM+
7		32	ALM-
8		33	PAO
9		34	*PAO
10		35	PBO
11		36	*PBO
12		37	
13		38	
14		39	
15		40	S-ON
16		41	
17		42	P-OT
18		43	N-OT
19	PCO	44	
20	*PCO	45	
21		46	
22		47	+24VIN
23		48	
24		49	
25		50	

1	PG0V	11	
2	PG0V	12	
3	PG0V	13	
4	PG5V	14	PC
5	PG5V	15	*PC
6	PG5V	16	PA
7		17	*PA
8		18	PB
9		19	*PB
10		20	FG



※ represents twisted pair cable

12.2 Connection with LG AC SERVO(FDA-5000/6000)

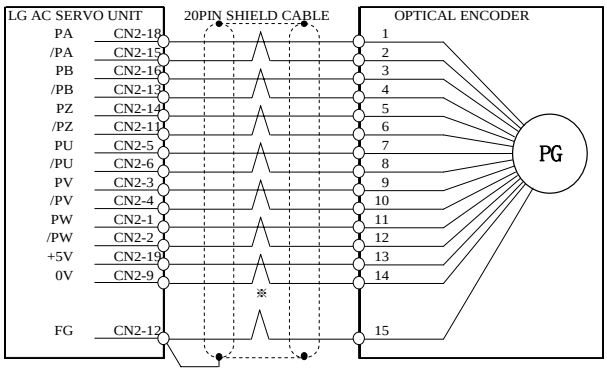


1	AG	14	VCMD
2		15	+24V
3		16	ENBLB
4		17	ENBLA
5	PZH	18	
6	PZL	19	
7	PBH	20	0V
8	PBL	21	SALM
9	PAH	22	SRDY
10	PAL	23	0V
11		24	COMMON
12		25	
13			

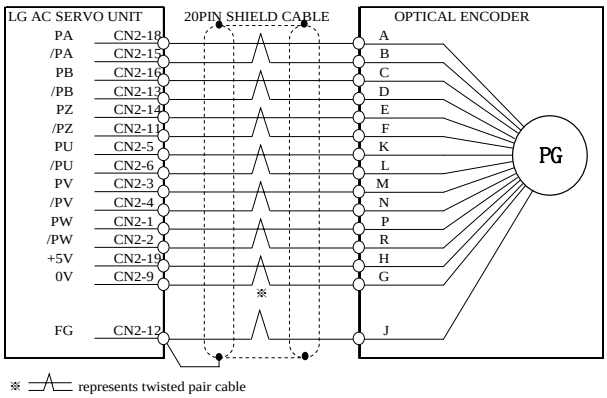
1	GND	26	GND
2		27	SPDIN
3		28	
4		29	
5	PZO	30	/PZO
6	PB0	31	/PBO
7	PAO	32	/PAO
8		33	
9		34	
10		35	
11		36	
12		37	
13		38	
14		39	
15	CCWLIN	40	CWLIM
16		41	
17		42	
18	SVONEN	43	
19		44	
20	ALARM	45	
21		46	
22		47	
23		48	
24	GND24V	49	+24VIN
25	GND24V	50	

1	PW	11	/PZ
2	/PW	12	FG
3	PV	13	/PB
4	/PV	14	PZ
5	PU	15	/PA
6	/PU	16	PB
7		17	
8		18	PA
9	0V	19	5V
10		20	

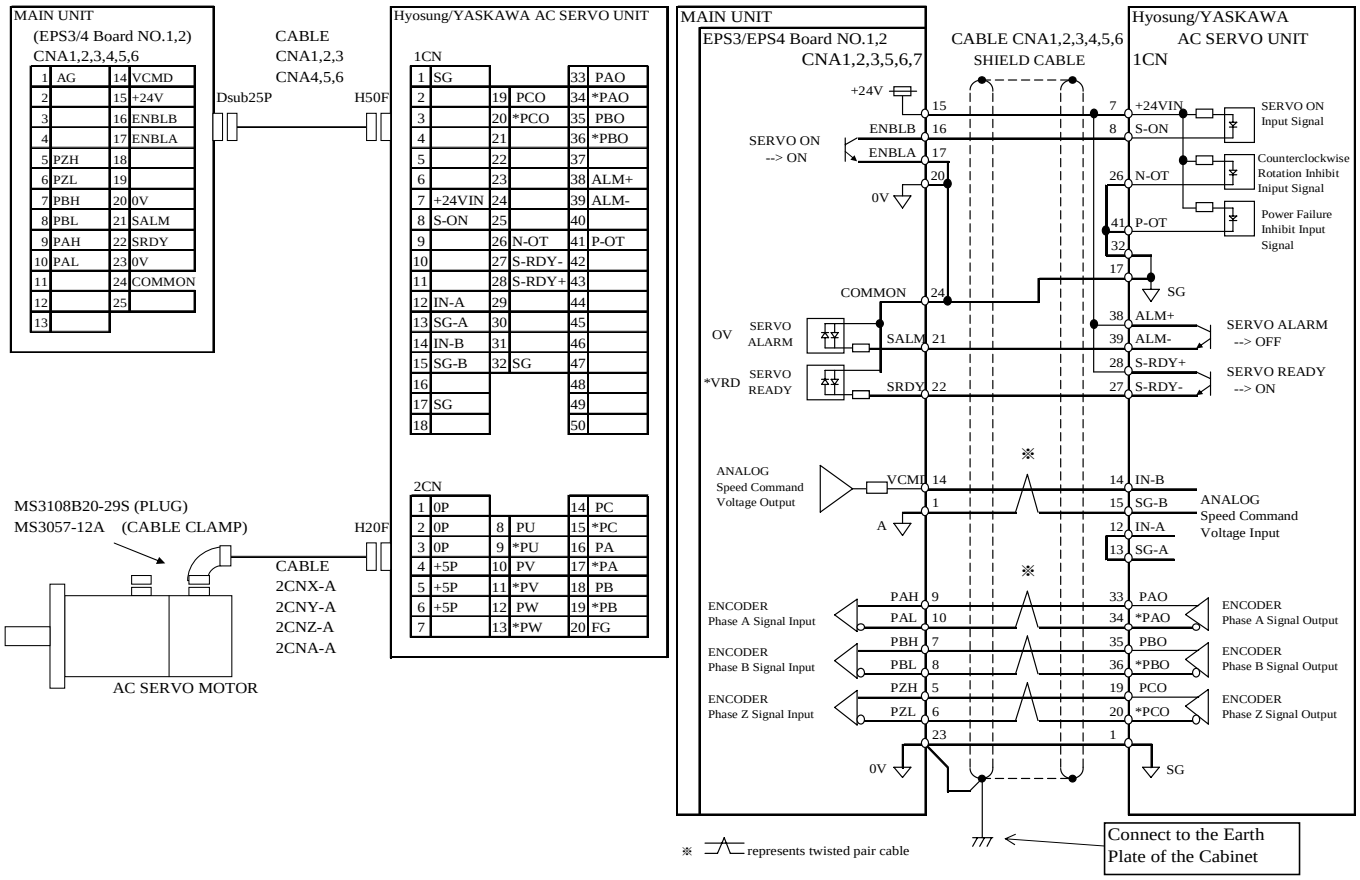
(A) When connecting FLANGE SIZE 60,80 MOTOR and FDA 5000

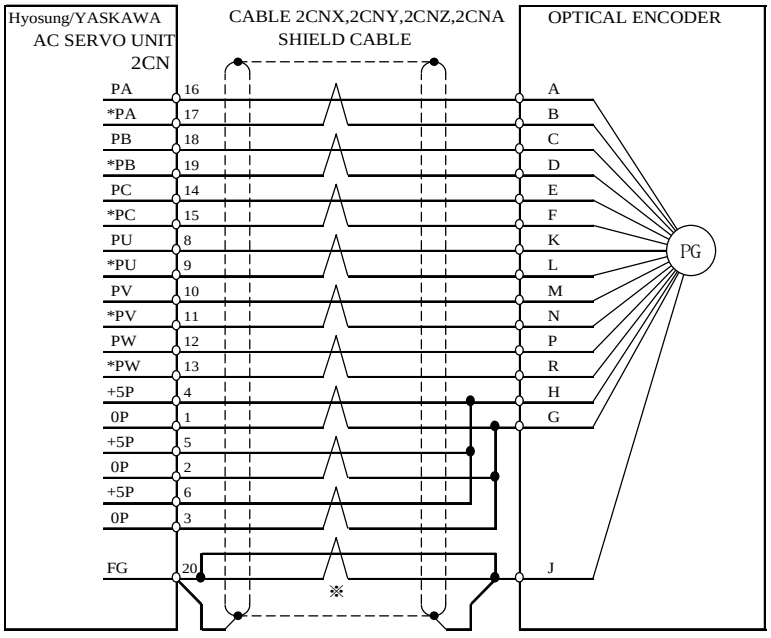


(B) Connecting FLANGE SIZE 130,180 MOTOR and FDA 5000

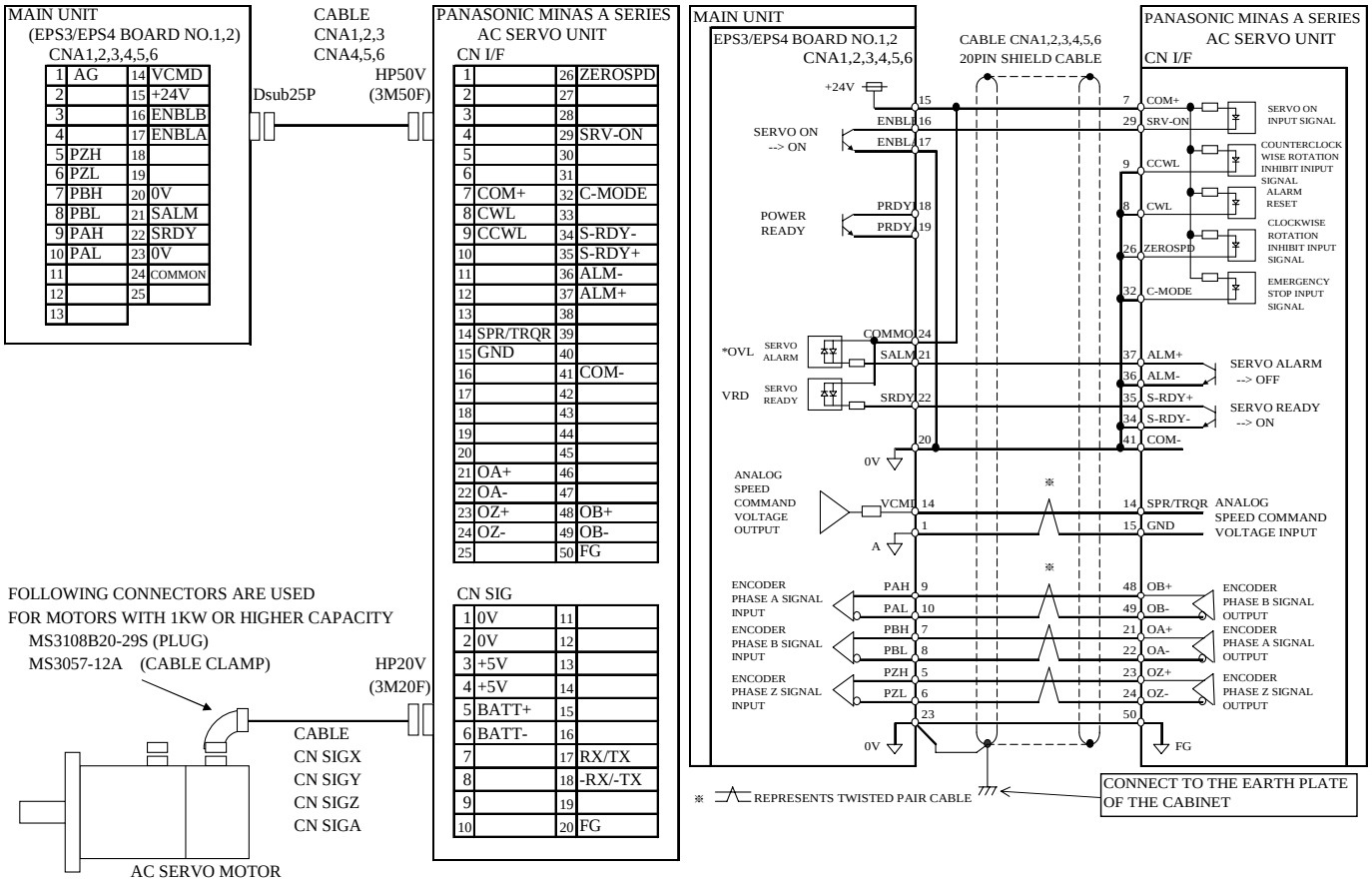


12.3 Connection with HYOSUNG/YASKAWA AC SERVO



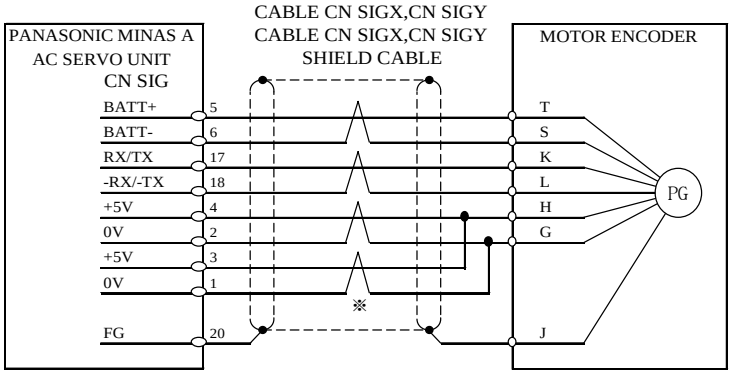


12.4 CONNECTION WITH PANASONIC MINAS A SERIES AC SERVO

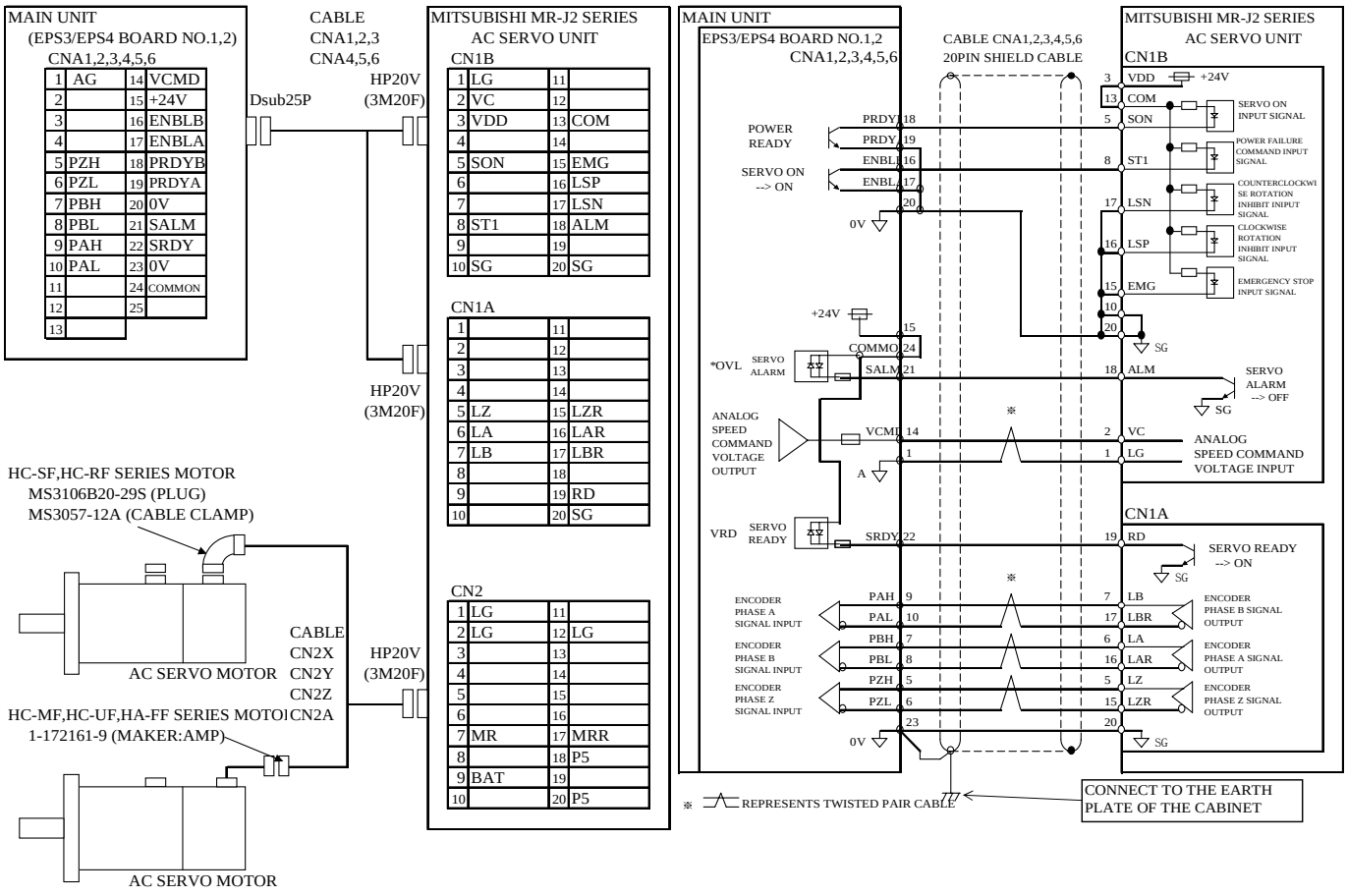


1	AG	14	VCMD	1		26	ZEROSPD
2		15	+24V	2		27	
3		16	ENBLB	3		28	
4		17	ENBLA	4		29	SRV-ON
5	PZH	18		5		30	
6	PZL	19		6		31	
7	PBH	20	0V	7	COM+	32	C-MODE
8	PBL	21	SALM	8	CWL	33	
9	PAH	22	SRDY	9	CCWL	34	S-RDY-
10	PAL	23	0V	10		35	S-RDY+
11		24	COMMON	11		36	ALM-
12		25		12		37	ALM+
13				13		38	
				14	SPR/TRQR	39	
				15	GND	40	
				16		41	COM-
				17		42	
				18		43	
				19		44	
				20		45	
				21	OA+	46	
				22	OA-	47	
				23	OZ+	48	OB+
				24	OZ-	49	OB-
				25		50	FG

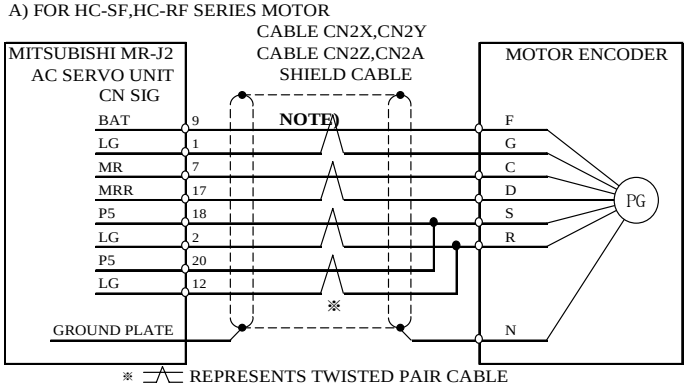
1	0V	11	
2	0V	12	
3	+5V	13	
4	+5V	14	
5	BATT+	15	
6	BATT-	16	
7		17	RX/TX
8		18	-RX/-TX
9		19	
10		20	FG



12.5 CONNECTION WITH MITSUBISHI MR-J2 SERIES AC SERVO

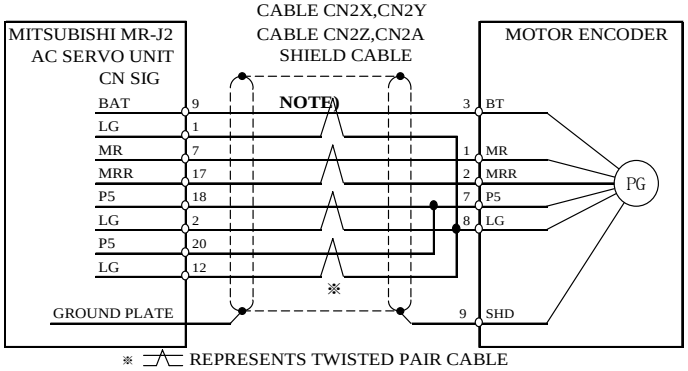


A) FOR HC-SF,HC-RF SERIES MOTOR



NOTE) CONNECT BAT SIGNAL FOR ABSOLUTE SYSTEM ONLY

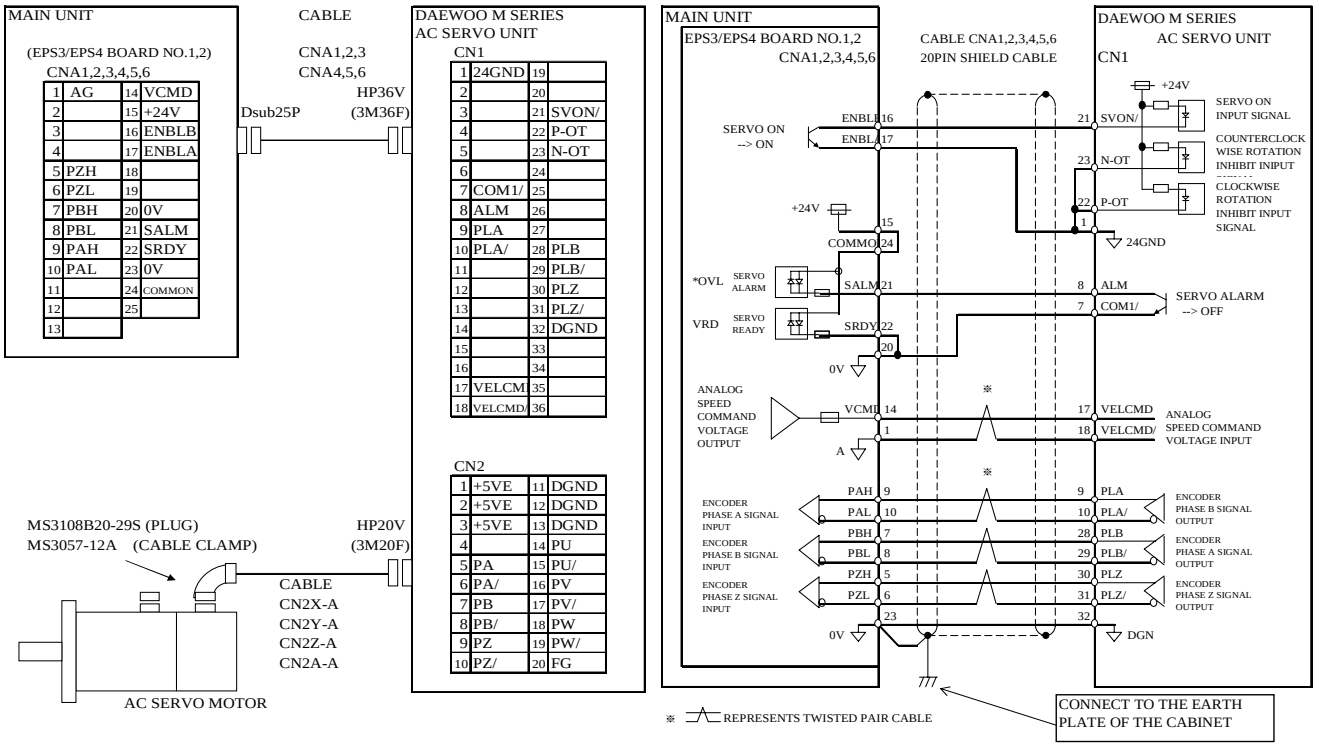
B) FOR HC-MF,HC-UF,HA-FF SERIES MOTOR



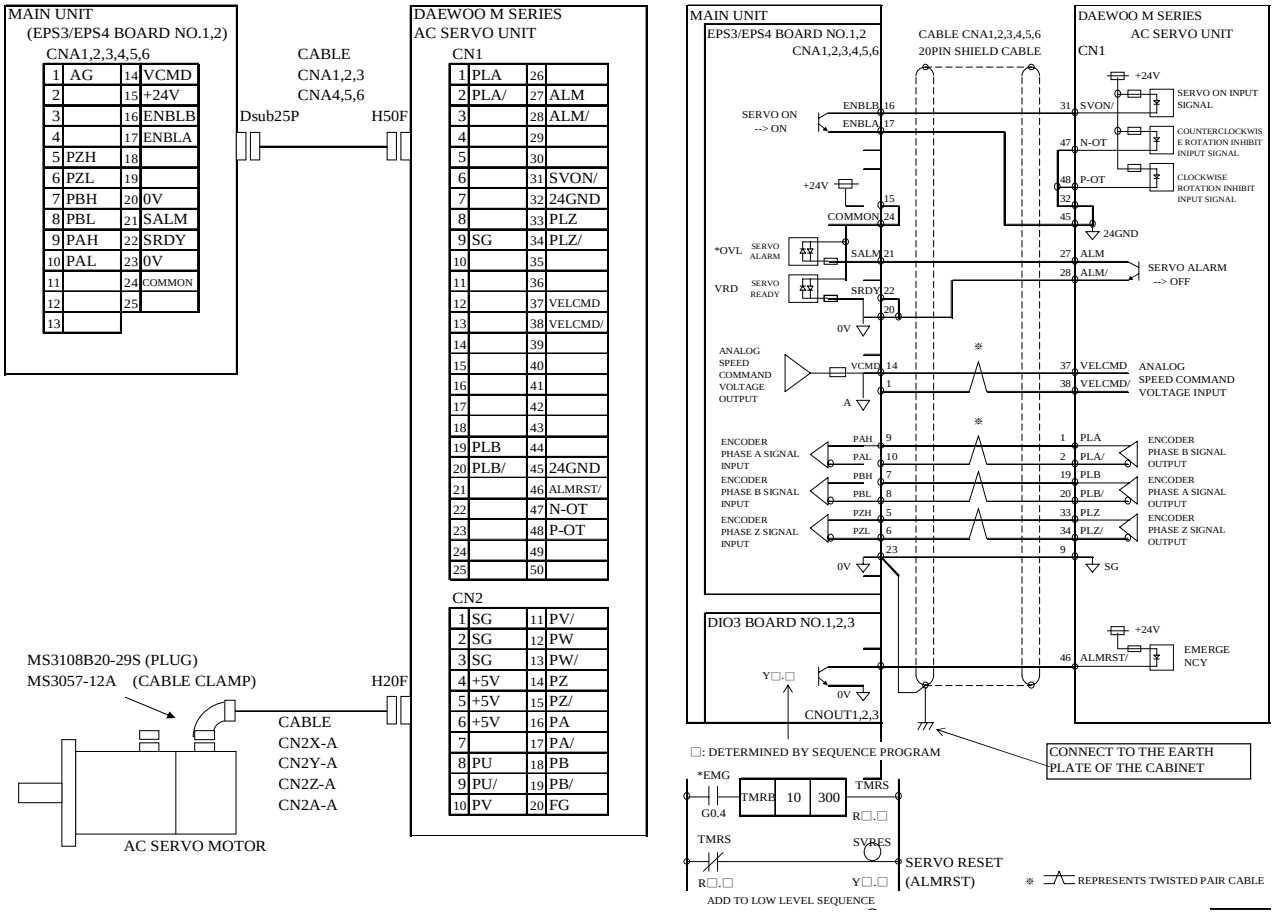
NOTE) CONNECT BAT SIGNAL FOR ABSOLUTE SYSTEM ONLY

12.6 CONNECTION WITH DAEWOO M SERIES AC SERVO

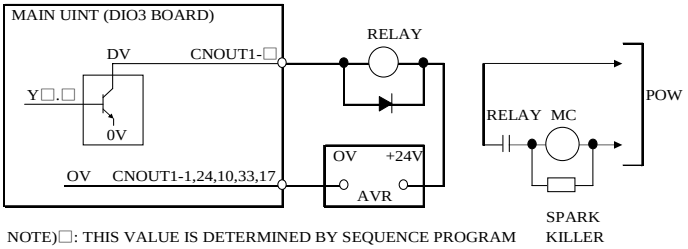
1) IF SERVO UNIT CONNECTOR IS HALF PITCH CONNECTOR (3M)



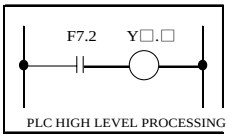
2) IF SERVO UNIT CONNECTOR IS HONDA CONNECTOR

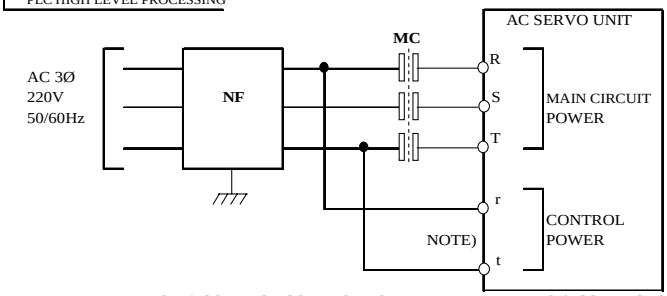


12.7 CONNECTION BETWEEN AC SERVO UNIT AND AC 220V POWER



NOTE)□: THIS VALUE IS DETERMINED BY SEQUENCE PROGRAM





NOTE) CONNECT CONTROL POWER WHEN THERE IS A CONNECTOR

13. CONNECTION BETWEEN SENTROL2 AND SPINDLE UNIT

13.1 CONNECTION WITH MITSUBISHI SPINDLE SG-J SERIES

MAIN UNIT
EPS3/EPS4 BOARD
CNS1

1	AG	14	VCMD
2	DOCOM	15	+24V
3	ORC	16	SRN
4	+5V	17	SRI
5	PZH	18	ESP
6	PZL	19	SET
7	PBH	20	0V
8	PBL	21	FA
9	PAH	22	ZS
10	PAL	23	0V
11	HSP	24	COMMON
12		25	USC
13	ORA		

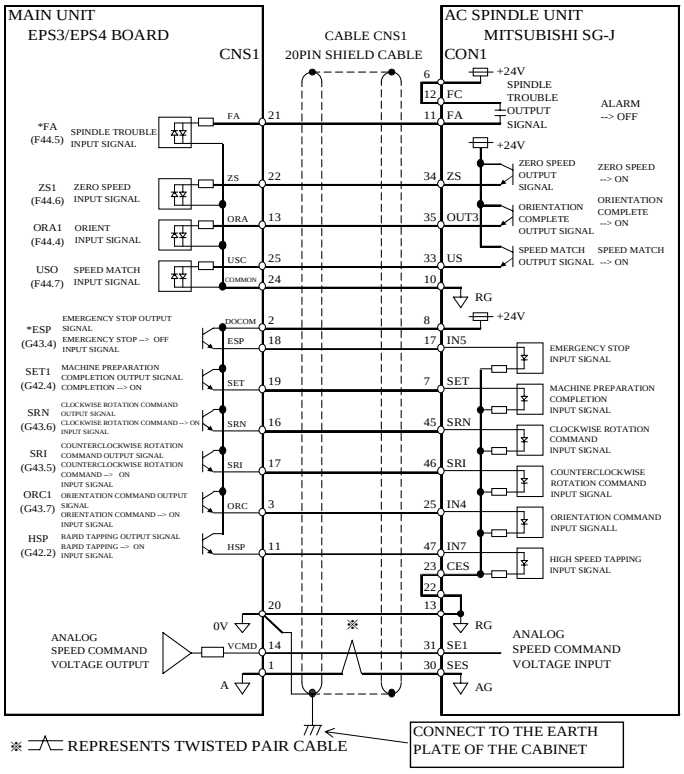
Dsub25P — H50F
CABLE CNS

AC SPINDLE UNIT
MITSUBISHI SG-J
CON1

1				33	US
2		19		34	ZS
3		20		35	OUT3
4		21		36	
5		22	RG	37	
6	+24V	23	CES	38	
7	SET	24		39	
8	+24V	25	IN4	40	
9		26		41	
10	RG	27		42	
11	FA	28		43	
12	FC	29		44	
13	RG	30	SES	45	SRN
14		31	SE1	46	SRI
15		32		47	IN7
16				48	
17	IN5			49	
18				50	

CABLE CNS1P

POSITION CODE
(FOR LATHE)


MAIN UNIT
EPS3/EPS4 BOARD
CNS1
CABLE CNS1
20PIN SHIELD CABLE
AC SPINDLE UNIT
MITSUBISHI SG-J
CON1
*FA (F44.5) SPINDLE TROUBLE INPUT SIGNAL
ZS1 (F44.6) ZERO SPEED INPUT SIGNAL
ORA1 (F44.4) ORIENT INPUT SIGNAL
USO (F44.7) SPEED MATCH INPUT SIGNAL
*ESP (G43.4) EMERGENCY STOP OUTPUT SIGNAL EMERGENCY STOP --> OFF INPUT SIGNAL
SET1 (G42.4) MACHINE PREPARATION COMPLETION OUTPUT SIGNAL COMPLETION --> ON
SRN (G43.6) CLOCKWISE ROTATION COMMAND OUTPUT SIGNAL CLOCKWISE ROTATION COMMAND --> ON INPUT SIGNAL
SRI (G43.5) COUNTERCLOCKWISE ROTATION COMMAND OUTPUT SIGNAL COUNTERCLOCKWISE ROTATION COMMAND --> ON INPUT SIGNAL
ORC1 (G43.7) ORIENTATION COMMAND OUTPUT SIGNAL ORIENTATION COMMAND --> ON INPUT SIGNAL
HSP (G42.2) RAPID TAPPING OUTPUT SIGNAL RAPID TAPPING --> ON INPUT SIGNAL
ANALOG SPEED COMMAND VOLTAGE OUTPUT
ANALOG SPEED COMMAND VOLTAGE INPUT
※ REPRESENTS TWISTED PAIR CABLE
CONNECT TO THE EARTH PLATE OF THE CABINET

13.2 CONNECITON WITH MITSUBISHI SPINDLE SF SERIES

MAIN UNIT
EPS3/EPS4 BOARD
CNS1

1	AG	14	VCMD
2	DOCOM	15	+24V
3	ORC	16	SRN
4	+5V	17	SRI
5	PZH	18	ESP
6	PZL	19	SET
7	PBH	20	0V
8	PBL	21	FA
9	PAH	22	ZS
10	PAL	23	0V
11		24	COMMON
12		25	USC
13	ORA		

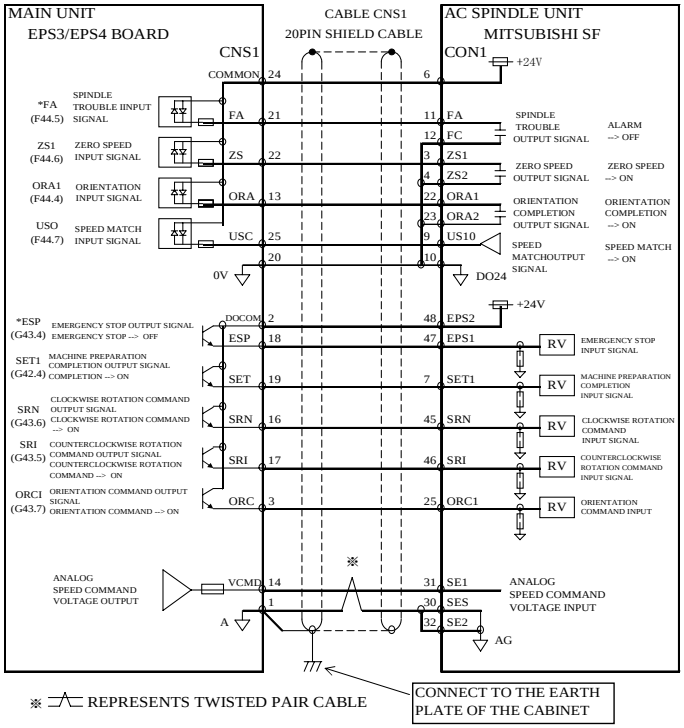
Dsub25P — H50F
CABLE CNS

AC SPINDLE UNIT
MITSUBISHI SF
CON1

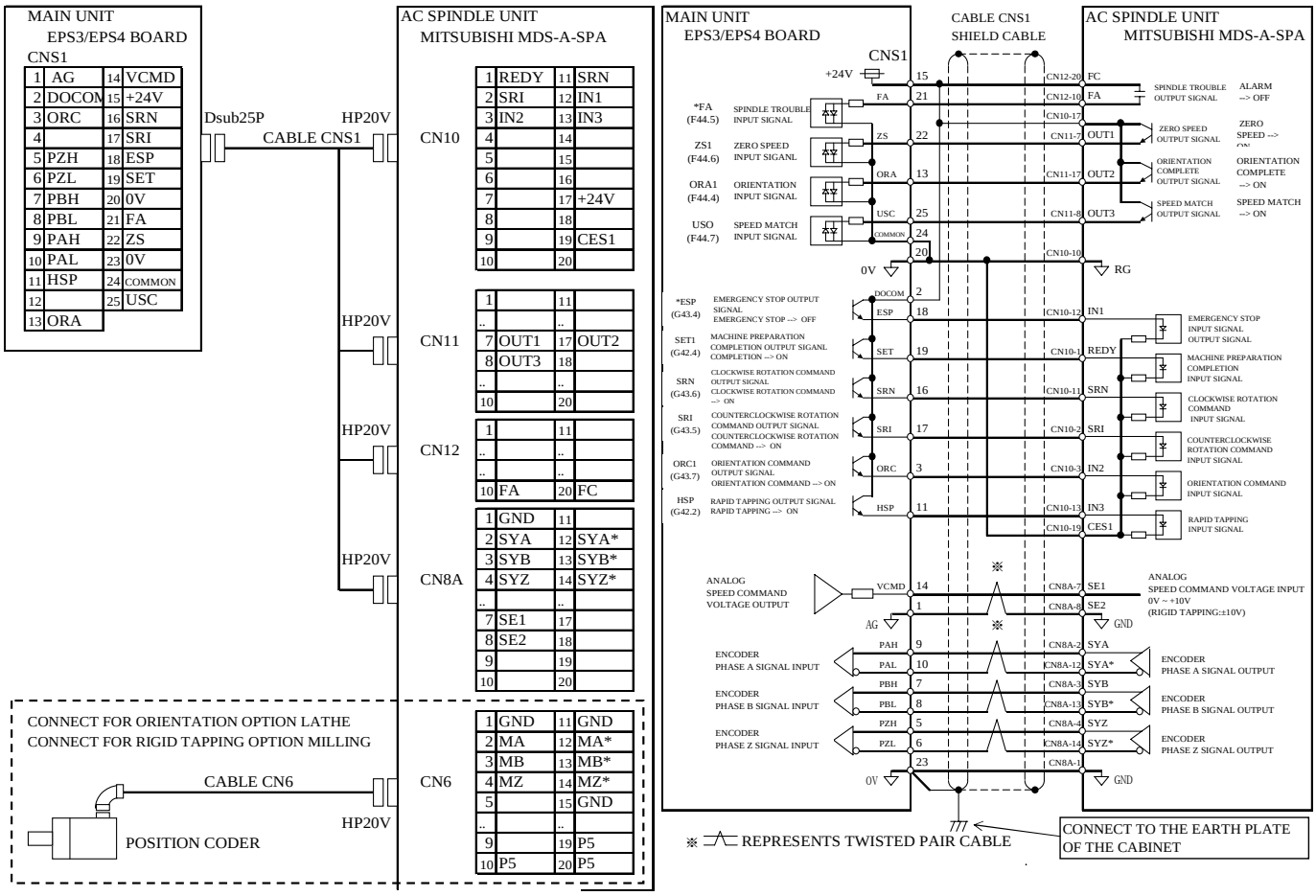
1				33	
2		19		34	
3	ZS1	20		35	
4	ZS2	21		36	
5		22	ORA1	37	
6	+24V	23	ORA2	38	
7	SET1	24		39	
8	SET2	25	ORC1	40	
9	US10	26	ORC2	41	
10	DO24	27		42	
11	FA	28		43	
12	FC	29		44	
13		30	SES	45	SRN
14	OS	31	SE1	46	SRI
15		32	SE2	47	ESP1
16				48	ESP2
17				49	
18				50	

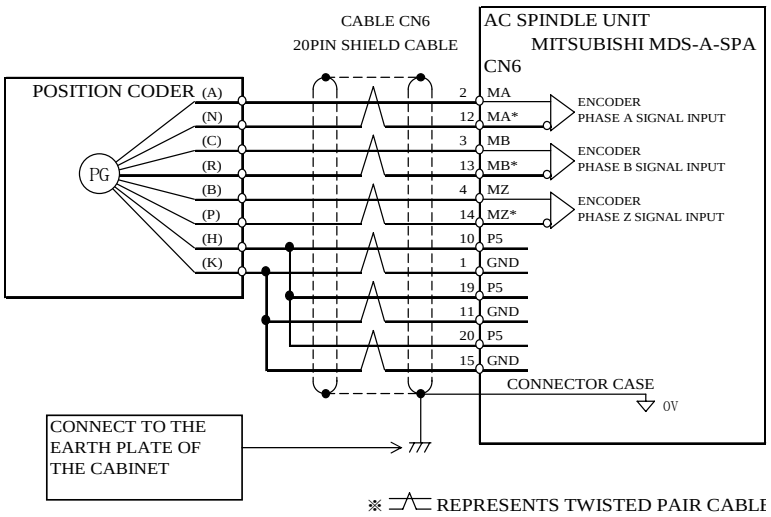
CABLE CNS1P

POSITION CODE
(FOR LATHE)


MAIN UNIT
EPS3/EPS4 BOARD
CNS1
CABLE CNS1
20PIN SHIELD CABLE
AC SPINDLE UNIT
MITSUBISHI SF
CON1
*FA (F44.5) SPINDLE TROUBLE IINPUT SIGNAL
ZS1 (F44.6) ZERO SPEED INPUT SIGNAL
ORA1 (F44.4) ORIENTATION INPUT SIGNAL
USO (F44.7) SPEED MATCH INPUT SIGNAL
*ESP (G43.4) EMERGENCY STOP OUTPUT SIGNAL EMERGENCY STOP --> OFF
SET1 (G42.4) MACHINE PREPARATION COMPLETION OUTPUT SIGNAL COMPLETION --> ON
SRN (G43.6) CLOCKWISE ROTATION COMMAND OUTPUT SIGNAL CLOCKWISE ROTATION COMMAND --> ON
SRI (G43.5) COUNTERCLOCKWISE ROTATION COMMAND OUTPUT SIGNAL COUNTERCLOCKWISE ROTATION COMMAND --> ON
ORCI (G43.7) ORIENTATION COMMAND OUTPUT SIGNAL ORIENTATION COMMAND --> ON
ANALOG SPEED COMMAND VOLTAGE OUTPUT
ANALOG SPEED COMMAND VOLTAGE INPUT
※ REPRESENTS TWISTED PAIR CABLE
CONNECT TO THE EARTH PLATE OF THE CABINET

13.3 CONNECTION WITH MITSUBISHI SPINDLE MDS-A-SPA SERIES




CABLE CN6
20PIN SHIELD CABLE
AC SPINDLE UNIT
MITSUBISHI MDS-A-SPA
CN6
POSITION CODER
PG
(A) (N) (C) (R) (B) (P) (H) (K)
MA MA* MB MB* MZ MZ* P5 GND P5 GND P5 GND
ENCODER PHASE A SIGNAL INPUT
ENCODER PHASE B SIGNAL INPUT
ENCODER PHASE Z SIGNAL INPUT
CONNECTOR CASE
0V
CONNECT TO THE EARTH PLATE OF THE CABINET
※ REPRESENTS TWISTED PAIR CABLE

13.4 CONNECTION WITH MITSUBISHI SPINDLE MDS-A-SPJA SERIES

MAIN UNIT
EPS3/EPS4 BOARD
CNS1

1	AG	14	VCMD
2	DOCOM	15	+24V
3	ORC	16	SRN
4	+5V	17	SRI
5	PZH	18	ESP
6	PZL	19	SET
7	PBH	20	0V
8	PBL	21	FA
9	PAH	22	ZS
10	PAL	23	0V
11	HSP	24	COMMON
12		25	USC
13	ORA		

Dsub25P — CABLE CNS1 — F40

NOTE)

NOT) CN1 SYMBOL

CONNECTOR	HIF3C-40D-2.54C
PIN	HIF3-2226SCA
MAKER	HIROSE KOREA

NOT REQUIRED WHEN RIGID TAPPING
WITH BUILT IN ENCODER

POSITION CODER

AC SPINDLE MOTOR

BUILT IN ENCODER

HP20V

HP20V

AC SPINDLE UNIT
MITSUBISHI MDS-A-SPJA
CN1

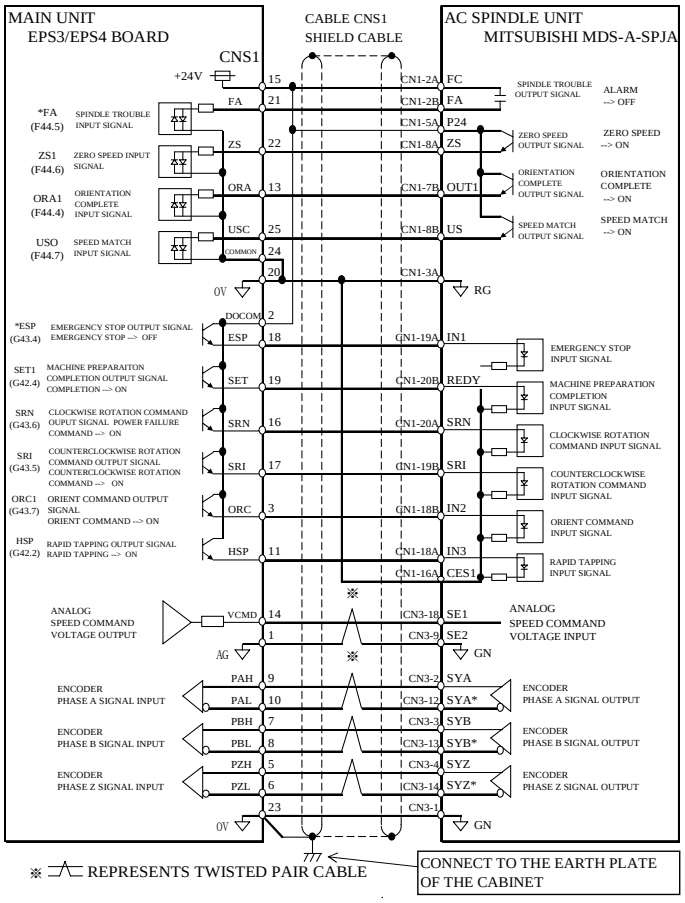
20B	REDY	20A	SRN
19B	SRI	19A	IN1
18B	IN2	18A	IN3
17B		17A	
16B		16A	CES1
15B		15A	
14B		14A	
13B		13A	
12B		12A	
11B		11A	
10B		10A	
9B		9A	
8B	US	8A	ZS
7B	OUT1	7A	
6B		6A	
5B		5A	P24
4B		4A	
3B		3A	RG
2B	FA	2A	FC
1B		1A	

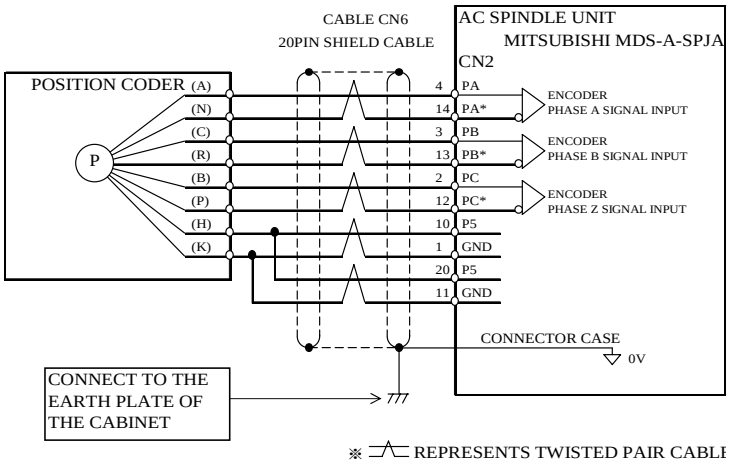
CN3

1	GND	11	GND
2	SYA	12	SYA*
3	SYB	13	SYB*
4	SYZ	14	SYZ*
..		..	
8		18	SE1
9	SE2	19	
10		20	

CN2

1	GND	11	GND
2	PC	12	PC*
3	PB	13	PB*
4	PA	14	PA*
5	MOH	15	RG
6	MA	16	MA*
7	MB	17	MB*
8	MZ	18	MZ*
9		19	P5
10	P5	20	P5


MAIN UNIT
EPS3/EPS4 BOARD
CABLE CNS1
SHIELD CABLE
AC SPINDLE UNIT
MITSUBISHI MDS-A-SPJA
CNS1
+24V
*FA (F44.5) SPINDLE TROUBLE INPUT SIGNAL
ZS1 (F44.6) ZERO SPEED INPUT SIGNAL
ORA1 (F44.4) ORIENTATION COMPLETE INPUT SIGNAL
USO (F44.7) SPEED MATCH INPUT SIGNAL
0V
*ESP (G43.4) EMERGENCY STOP OUTPUT SIGNAL
SET1 (G42.4) MACHINE PREPARAITON COMPLETION OUTPUT SIGNAL
SRN (G43.6) CLOCKWISE ROTATION COMMAND OUPUT SIGNAL
SRI (G43.5) COUNTERCLOCKWISE ROTATION COMMAND OUTPUT SIGNAL
ORC1 (G43.7) ORIENT COMMAND OUTPUT SIGNAL
HSP (G42.2) RAPID TAPPING OUTPUT SIGNAL
ANALOG SPEED COMMAND VOLTAGE OUTPUT
ENCODER PHASE A SIGNAL INPUT
ENCODER PHASE B SIGNAL INPUT
ENCODER PHASE Z SIGNAL INPUT
SPINDLE TROUBLE OUTPUT SIGNAL
ALARM --> OFF
ZERO SPEED OUTPUT SIGNAL
ZERO SPEED --> ON
ORIENTATION COMPLETE OUTPUT SIGNAL
ORIENTATION COMPLETE --> ON
SPEED MATCH OUTPUT SIGNAL
SPEED MATCH --> ON
EMERGENCY STOP INPUT SIGNAL
MACHINE PREPARATION COMPLETION INPUT SIGNAL
CLOCKWISE ROTATION COMMAND INPUT SIGNAL
COUNTERCLOCKWISE ROTATION COMMAND INPUT SIGNAL
ORIENT COMMAND INPUT SIGNAL
RAPID TAPPING INPUT SIGNAL
ANALOG SPEED COMMAND VOLTAGE INPUT
ENCODER PHASE A SIGNAL OUTPUT
ENCODER PHASE B SIGNAL OUTPUT
ENCODER PHASE Z SIGNAL OUTPUT
※ REPRESENTS TWISTED PAIR CABLE
CONNECT TO THE EARTH PLATE OF THE CABINET



13.5 CONNECTION WITH FUJI SPINDLE FRENIC 5000M3

MAIN UNIT
EPS3/EPS4 BOARD
CNS1

1	AG	14	VCMD
2	DOCOM	15	+24V
3		16	SRN
4	+5V	17	SRI
5	PZH	18	
6	PZL	19	
7	PBH	20	0V
8	PBL	21	AL
9	PAH	22	SST
10	PAL	23	
11	RST	24	COMMON
12		25	SAR
13			

Dsub25P H50F
CABLE CNS

AC SPINDLE UNIT
FUJI FRENIC 5000M3
CN1

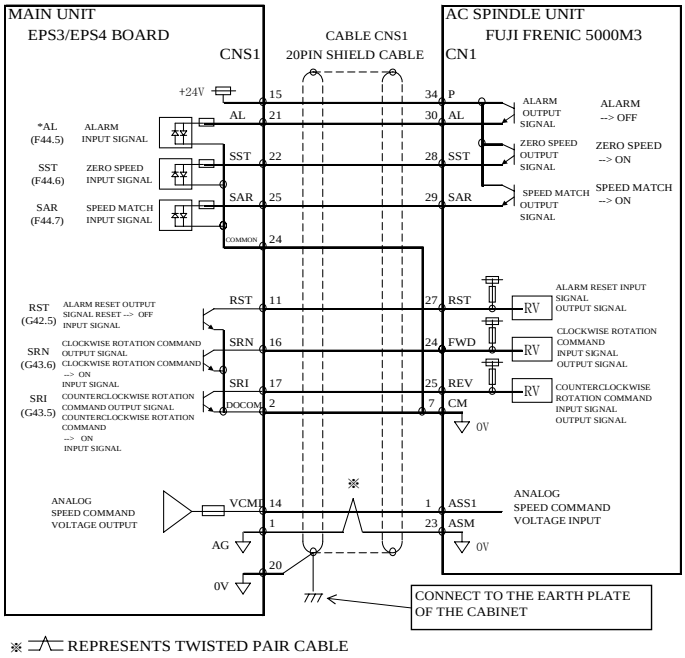
1	ASS1	23	ASM
2		24	FWD
3		25	REV
4		26	
5		27	RST
6		28	SST
7	CM	29	SAR
8		30	AL
9		31	
10		32	
11		33	
12		34	P

CABLE CNS1P

NOTE) SET PARAMETER NO. 9103 AS FOLLOWS.

9103	SP1	SP0
	1	0

POSITION CODER
(FOR LATHE)


MAIN UNIT
EPS3/EPS4 BOARD
CNS1
CABLE CNS1
20PIN SHIELD CABLE
AC SPINDLE UNIT
FUJI FRENIC 5000M3
CN1
+24V
*AL (F44.5) ALARM INPUT SIGNAL
SST (F44.6) ZERO SPEED INPUT SIGNAL
SAR (F44.7) SPEED MATCH INPUT SIGNAL
COMMON
ALARM OUTPUT SIGNAL
ALARM --> OFF
ZERO SPEED OUTPUT SIGNAL
ZERO SPEED --> ON
SPEED MATCH OUTPUT SIGNAL
SPEED MATCH --> ON
RST (G42.5) ALARM RESET OUTPUT SIGNAL RESET --> OFF INPUT SIGNAL
SRN (G43.6) CLOCKWISE ROTATION COMMAND OUTPUT SIGNAL CLOCKWISE ROTATION COMMAND --> ON INPUT SIGNAL
SRI (G43.5) COUNTERCLOCKWISE ROTATION COMMAND OUTPUT SIGNAL COUNTERCLOCKWISE ROTATION COMMAND --> ON INPUT SIGNAL
ALARM RESET INPUT SIGNAL OUTPUT SIGNAL
CLOCKWISE ROTATION COMMAND INPUT SIGNAL OUTPUT SIGNAL
COUNTERCLOCKWISE ROTATION COMMAND INPUT SIGNAL OUTPUT SIGNAL
RV
0V
※
ANALOG SPEED COMMAND VOLTAGE OUTPUT
ANALOG SPEED COMMAND VOLTAGE INPUT
CONNECT TO THE EARTH PLATE OF THE CABINET

※ REPRESENTS TWISTED PAIR CABLE

13.6 CONNECTION WITH FUJI SPINDLE FRENIC 5000MS5

MAIN UNIT
EPS3/EPS4 BOARD
CNS1

1	AG	14	VCMD
2	DOCOM	15	+24V
3		16	SRN
4	+5V	17	SRI
5	PZH	18	
6	PZL	19	
7	PBH	20	0V
8	PBL	21	AL
9	PAH	22	SST
10	PAL	23	
11	RST	24	COMMON
12		25	SAR
13			

Dsub25P HP20V
CABLE CNS

AC SPINDLE UNIT
FUJI FRENIC 5000MS5
CN3

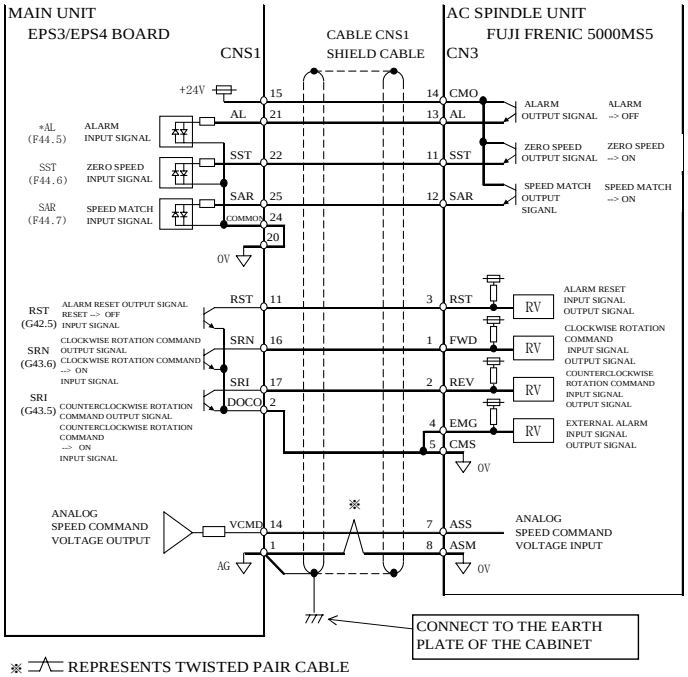
1	FWD	11	SST
2	REV	12	SAR
3	RST	13	AL
4	EMG	14	CMO
5	CMS	15	
6		16	
7	ASS	17	
8	ASM	18	
9		19	
10		20	

CABLE CNS1P

NOTE) SET PARAMETER NO. 9103 AS FOLLOWS.

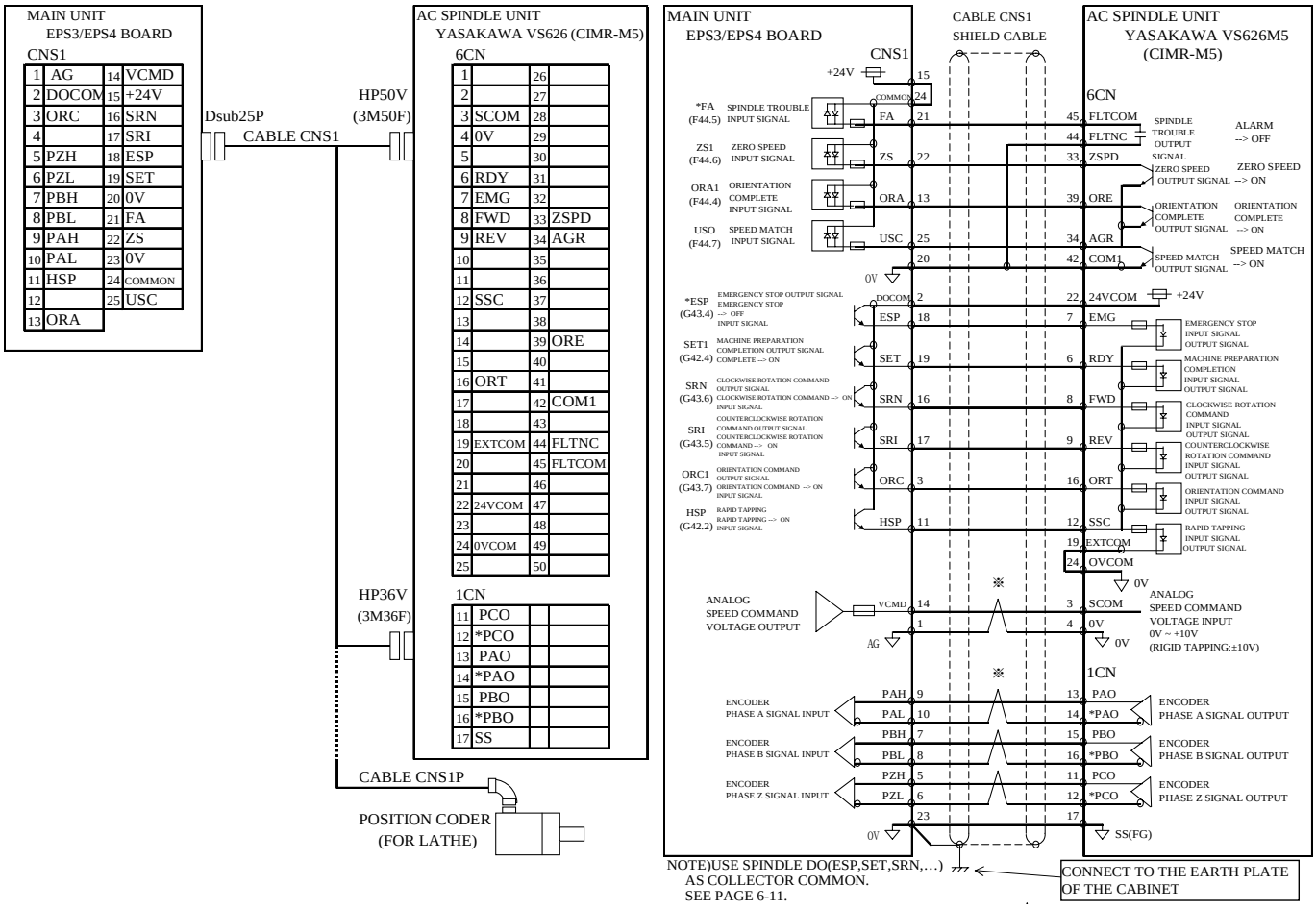
9103	SP1	SP0
	1	0

POSITION CODER
(FOR LATHE)


MAIN UNIT
EPS3/EPS4 BOARD
CNS1
CABLE CNS1
SHIELD CABLE
AC SPINDLE UNIT
FUJI FRENIC 5000MS5
CN3
+24V
*AL (F44.5) ALARM INPUT SIGNAL
SST (F44.6) ZERO SPEED INPUT SIGNAL
SAR (F44.7) SPEED MATCH INPUT SIGNAL
COMMON
ALARM OUTPUT SIGNAL
ALARM --> OFF
ZERO SPEED OUTPUT SIGNAL
ZERO SPEED --> ON
SPEED MATCH OUTPUT SIGNAL
SPEED MATCH --> ON
RST (G42.5) ALARM RESET OUTPUT SIGNAL RESET --> OFF INPUT SIGNAL
SRN (G43.6) CLOCKWISE ROTATION COMMAND OUTPUT SIGNAL CLOCKWISE ROTATION COMMAND --> ON INPUT SIGNAL
SRI (G43.5) COUNTERCLOCKWISE ROTATION COMMAND OUTPUT SIGNAL COUNTERCLOCKWISE ROTATION COMMAND --> ON INPUT SIGNAL
ALARM RESET INPUT SIGNAL OUTPUT SIGNAL
CLOCKWISE ROTATION COMMAND INPUT SIGNAL OUTPUT SIGNAL
COUNTERCLOCKWISE ROTATION COMMAND INPUT SIGNAL OUTPUT SIGNAL
EXTERNAL ALARM INPUT SIGNAL OUTPUT SIGNAL
RV
0V
※
ANALOG SPEED COMMAND VOLTAGE OUTPUT
ANALOG SPEED COMMAND VOLTAGE INPUT
CONNECT TO THE EARTH PLATE OF THE CABINET

※ REPRESENTS TWISTED PAIR CABLE

13.7 CONNECTION WITH YASAKAWA VS626M5

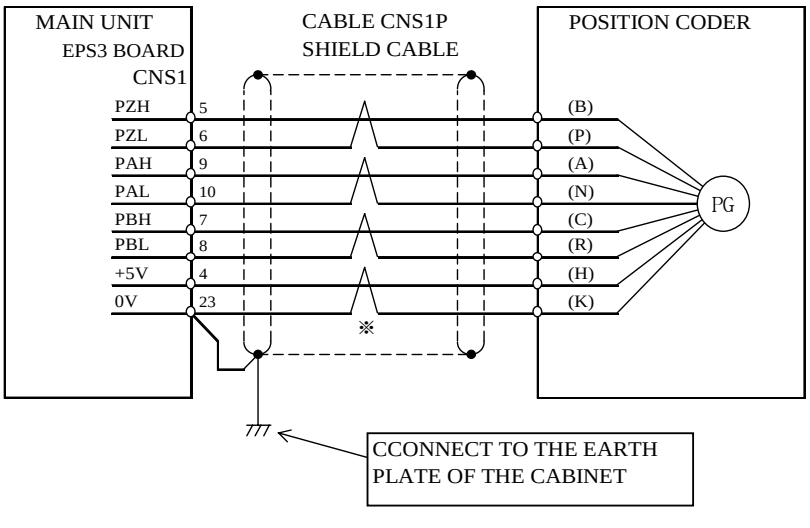


1	AG	14	VCMD
2	DOCOM	15	+24V
3	ORC	16	SRN
4		17	SRI
5	PZH	18	ESP
6	PZL	19	SET
7	PBH	20	0V
8	PBL	21	FA
9	PAH	22	ZS
10	PAL	23	0V
11	HSP	24	COMMON
12		25	USC
13	ORA		

1		26	
2		27	
3	SCOM	28	
4	0V	29	
5		30	
6	RDY	31	
7	EMG	32	
8	FWD	33	ZSPD
9	REV	34	AGR
10		35	
11		36	
12	SSC	37	
13		38	
14		39	ORE
15		40	
16	ORT	41	
17		42	COM1
18		43	
19	EXTCOM	44	FLTNC
20		45	FLTCOM
21		46	
22	24VCOM	47	
23		48	
24	0VCOM	49	
25		50	

11	PCO		
12	*PCO		
13	PAO		
14	*PAO		
15	PBO		
16	*PBO		
17	SS		

13.8 CONNECTION WITH POSITION CODER



※ REPRESENTS TWISTED PAIR

*) 20P SHIELD CABLE
*) LENGTH MAX 14m
*) NUMBER OF CALBES OF +5V AND 0V
3 EACH IN CASE THE LENGTH OF THE CABLE IS 8m OR LES
6 EACH IN CASE THE LENGTH OF THE CABLE IS GREATER

14. DNC FUNCTION

14.1 WHAT IS DNC?

Normally, NC operates automatically by executing the built-in programs.
Unlike NC, DNC (Direct Numerical Control) executes programs it received from external devices such as PCs through a communication network while operating automatically.
Complex processes such as the mold are usually created with CAM, and the complex processing curve is created by connecting short linear interpolating (G01) microblocks.
As a consequence, the program becomes longer and cannot be built into the NC Memory, and this is where DNC is required. Also, the program DNC received through the communication network will be cleared from NC memory as soon as it is executed for each block.

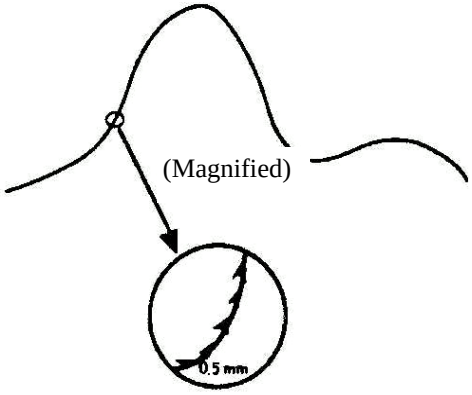


Fig. Example of microblock process

14.2 Preparation for DNC Operation

1) Scope of Effect of Communication Data

%
;
O0001
(PROGRAM)
G40
……
;
%

Scope of Effect (Subject of Execution)

Concerning the data received from an external device through communication line, NC considers the data between ;(end of block) which comes after the first %(end of record) and the second % as the scope of effect.

2) STANDARD PARAMETERS FOR COMMUNICATION

① COMMUNICATION BETWEEN PC AND SENTROL2

NO.0000 <TVC> = 0 (DOES NOT CHECK TV)

NO.0000 <CTV> = 0 (DID NOT CHECK TV IN COMMENTS)

NO.0000 <ISP> = 0 (THERE IS PARITY BIT)

NO.0000 <NCR> = 1 (EOB : LF)

NO.0000 <EIA> = 0 (ISO CODE)

NO.0020 = 0 (INPUT THROUGH COM1)

NO.0021 = 0 (OUTPUT THROUGH COM1)

NO.5001 = 1 (SELECT NO.5110~5112 PARAMETER GROUP)

NO.5110 = 3

NO.5111 = 2 (NUMBER OF STOP BIT: 2)

NO.5112 = 11 (9600 BAUD)